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STATIC STABILITY AND AXIAL-FORCE CHARACTERISTICS OF SEVERAL FLAT-FACED RIGHT CIRCULAR CYLINDERS AT SUBSONIC AND SUPERSONIC SPEEDS AND ANGLES OF ATTACK FROM 0 TO 90 DEGREES

R. W. Rhudy and S. S. Baker
ARO, Inc.

January 1973

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VON KÁRMÁN GAS DYNAMICS FACILITY
ARNOLD ENGINEERING DEVELOPMENT CENTER
AIR FORCE SYSTEMS COMMAND
ARNOLD AIR FORCE STATION, TENNESSEE

NOTICES

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FOREWORD

The work reported herein was done by the Arnold Engineering Development Center (AEDC) at the request of the Air Force Flight Dynamics Laboratory (AFFDL), Recovery and Crew Station Branch (FER), of the Air Force Systems Command (AFSC), under Program Element 62201F, Project 6065, Task 05.

The results presented were obtained by ARO, Inc. (a subsidiary of Sverdrup & Parcel and Associates, Inc.), contract operator of AEDC, Arnold Air Force Station, Tennessee. The tests were conducted during the period from July 6, 1972 through July 13, 1972 under ARO Project No. VA106. The final data reduction was completed on August 7, 1972, and the manuscript was submitted for publication on September 28, 1972.

This technical report has been reviewed and is approved.

JIMMY W. MULLINS	A. L. COAPMAN
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ABSTRACT

Tests were conducted at Mach numbers from 0.2 to 0.8 and 1.5 to 2.5 to determine the effects of fineness ratio and angles of attack up to 90 deg on the static longitudinal stability and axial force of a flat-faced cylinder. Data are presented to show that, at subsonic speeds, a reduction in the length-to-diameter ratio from 1.5 to 0.75 caused an increase in the total axial force, a decrease in normal force (in fact slightly negative normal force at small angles of attack), and a decrease in the absolute magnitude of the pitching moment over the entire pitch range. At supersonic speeds, total axial force was nearly independent of fineness ratio, for the range tested, while normal force and pitching moment decreased with a decrease in length-to-diameter ratio. Tabulated and plotted data for the entire test matrix are presented.

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ILLUSTRATIONS

APPENDIXES

NOMENCLATURE

A	Reference area, 12.44 in.^{2}
C_{AF}	Forebody axial-force coefficient, forebody axial force/$q_\infty A$
C_{AT}	Total axial-force coefficient, total axial force/$q_\infty A$
C_m	Pitching-moment coefficient, pitching moment/$q_\infty Ad$
C_N	Normal-force coefficient, normal force/$q_\infty A$
C'_N	Normal-force coefficient based on frontal area, normal force/q_∞/Ld
d	Cylinder diameter, 3.98 in.
F_A	Axial force, lb
F_N	Normal force, lb
L	Cylinder length, in.
M	Mach number
p	Pressure, psia
q	Dynamic pressure, psia
Re_d	Reynolds number based on free-stream conditions and cylinder diameter, d
T	Temperature, °R
X_{CP}/L	Center-of-pressure location in percent of length, $0.5 - (C_m/C_N)(d/L)$
α	Angle of attack, deg
θ	Angle between cylinder and balance axes, deg

SUBSCRIPTS

t	Total
∞	Free-stream value

SECTION I
INTRODUCTION

An experimental investigation was conducted in the 40-in. Supersonic Wind Tunnel (A) of the von Kármán Gas Dynamics Facility (VKF) to determine the axial-force and static-stability characteristics of several short flat-faced cylinders. The cylinders had length-to-diameter ratios (L/d) of 0.75, 1.15, and 1.53 and were tested at angles of attack from 0 to 90 deg. The tests were conducted at free-stream Mach number ranges from 0.2 to 0.8 and 1.5 to 2.5 and free-stream Reynolds numbers, based on cylinder diameters, of 0.5, 1.0, and 1.5 million. The tests were made in response to a request from AFFDL/FER for experimental data applicable to studies of the flight behavior of drogue parachute containers.

Results are presented, for the entire range of test variables, to show the influence of Mach number, L/d, angle of attack, and Reynolds number based on the axial force and static stability. The results from the present tests are compared to limited results found in the literature for similar test variables.

SECTION II
APPARATUS

2.1 MODELS

Four flat-faced right-circular cylinders, 3.98 in. in diameter and 6.08 in. long (giving an L/d ratio of 1.53) were fabricated from aluminum. The balance was recessed into each cylinder at a different angle (θ), between the balance axis and cylinder axis (θ = 10, 33, 56, and 79 deg) with the balance attachment being at the geometric center of the cylinders. In addition to providing for the desired pitch range, in conjunction with the tunnel pitch mechanism, the angles were chosen to minimize the sting support interference. The length of each cylinder was reduced twice during the test by cutting both ends so that the balance attachment remained at the geometric center, thus providing additional cylinder L/d ratios of 1.15 and 0.75. The L/d = 0.75 and θ = 33 model is shown installed in the tunnel in Fig. 1, and the model dimensions and axis system are given in Fig. 2.

2.2 INSTRUMENTATION

Tunnel A stilling chamber pressure was measured with 15-psid and 60-psid transducers referenced to a near vacuum. Based on periodic comparisons with secondary standards, the precision of these transducers (a band which contains 95 percent of the residuals) is estimated to be ±0.5 percent of the reading but no better than 0.015 psid. Stilling chamber temperature is measured with a copper-constantan thermocouple to a precision of ±0.5 percent or ±0.75°F, whichever is larger, based on the thermocouple wire manufacturer's specifications.

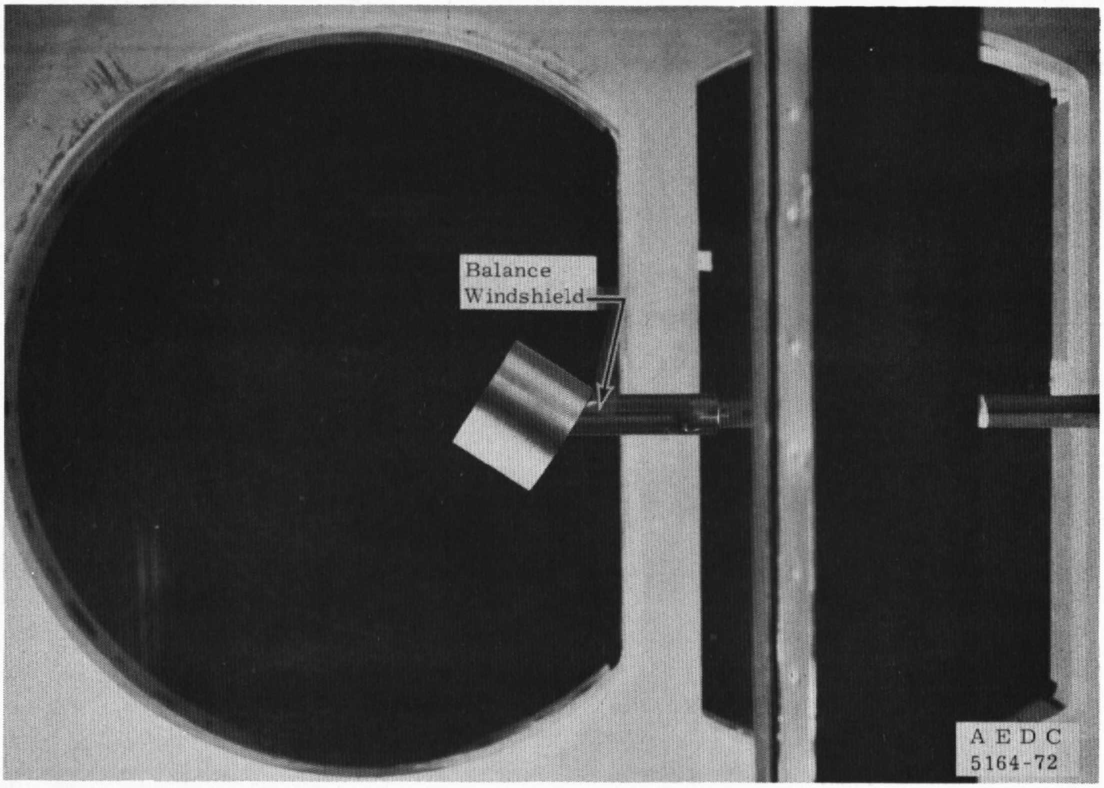


Fig. 1 L/d = 0.75 Model Installed in Tunnel A

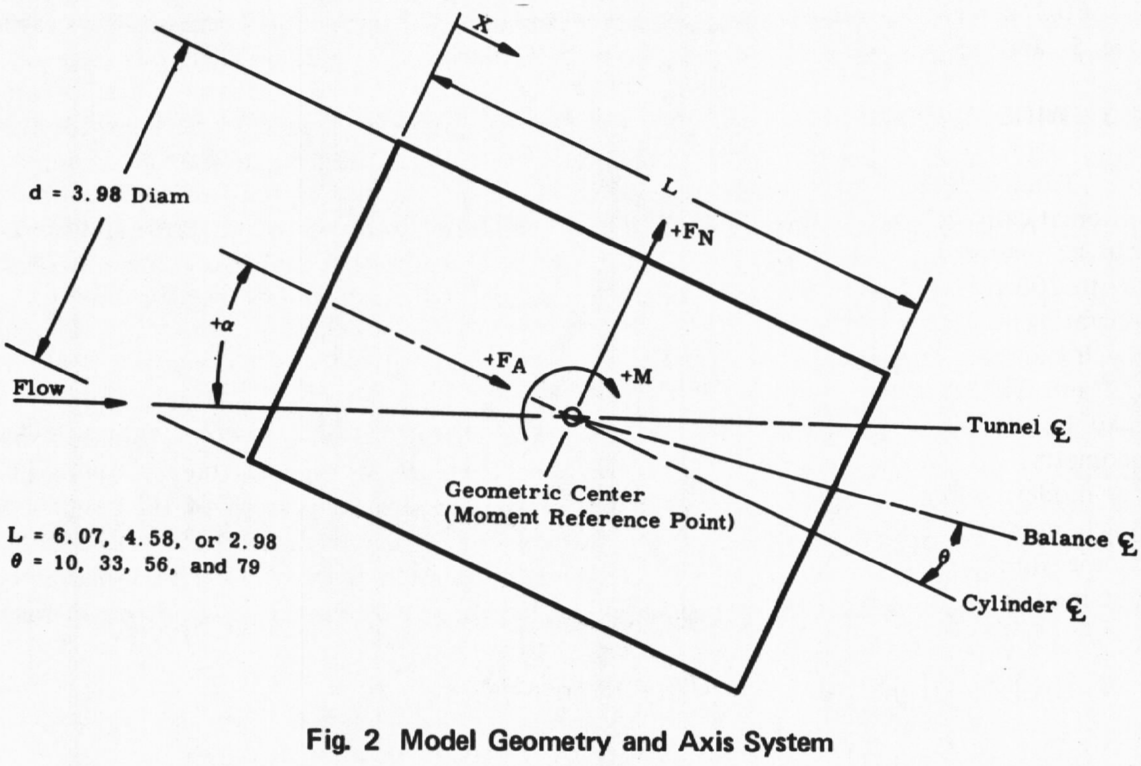


Fig. 2 Model Geometry and Axis System

Model forces and moments were measured with a six-component, moment-type, strain-gage balance supplied and calibrated by VKF. Before testing, static loads in each plane and combined static loads were applied to the balance, simulating the range of model loads anticipated for the test. The following uncertainties represent the bands for 95 percent of the measurement residuals based on differences between applied loads and corresponding values calculated from the final data reduction equations.

Balance Components	Design Load	Range of Static Loads	Measurement Uncertainty
Normal force, lb	500	±300	±0.85
Pitching moment*, in.-lb	1850	±335	±3.00
Axial force, lb	300	0 to 200	±0.75

*About balance forward moment bridge

The transfer distance to the model reference point, 1.484 in. for all models, was measured with a precision of ±0.010 in.

The balance cavity pressure, which was used to obtain a base pressure correction for the θ = 10 model at α = 0 only, was measured with a 15-psid transducer referenced to near vacuum and with full-scale calibrated ranges of 1, 5, and 15 psi. Based on periodic comparisons with secondary standards, the precision of this transducer is estimated to be ±0.3 percent of full scale for the 1-psid range, and ±0.2 percent of full scale for the 5- and 15-psid ranges.

2.3 WIND TUNNEL

Tunnel A is a continuous, closed-circuit, variable-density wind tunnel with an automatically driven, flexible-plate-type nozzle and a 40- by 40-in. test section. The tunnel can be operated at Mach numbers from 1.5 to 6 at maximum stagnation pressures from 29 to 200 psia, respectively, and stagnation temperatures up to 750°R (M_∞ = 6). Minimum operating pressures range from about one-tenth to one-twentieth of the maximum at each Mach number. Tunnel A is also capable of operating at subsonic Mach numbers between 0.2 and 0.8 for certain types of aerodynamic testing. Any Mach number within this range may be set by monitoring tunnel sidewall static pressures in conjunction with diffuser geometry. The model may be injected into the tunnel for a test run and then retracted for model cooling or model changes without interrupting the tunnel flow. The subsonic Mach numbers used for data reduction were calculated for each model attitude by use of the stilling chamber and tunnel side-wall pressures, whereas the supersonic values were obtained from the tunnel calibrations.

SECTION III
TEST PROCEDURE

3.1 TEST CONDITIONS AND METHODS

The tests were conducted at nominal free-stream Mach numbers from 0.2 to 2.5 at nominal free-stream Reynolds numbers, based on the cylinder diameter, of 0.5 to 1.5 million. A tabulation of the test conditions is given in Table I (Appendix I), and a complete test matrix is given in Table II.

Before injection into the tunnel, each model was adjusted to zero roll and the proper pitch angle, θ, to within ±0.1 deg by use of an inclinometer; all other pitch angles were set to within ±0.1 deg by use of the standard tunnel pitch mechanism. After a Mach number, Reynolds number, and pitch matrix was completed on a model, it was removed from the balance and each end was cut off to obtain the next smaller L/d. As stated previously, the cylinders were cut so that the balance attachment remained at the geometric center of all models.

3.2 UNCERTAINTIES OF THE DATA

An evaluation of the influence of random measurement errors is presented in this section to provide a partial measure of the precision of the results contained in this report. No evaluation of the systematic measurement error (bias) is included. Therefore, the precision of the test results was estimated using the estimated instrumentation precisions quoted in Section II, and the uncertainties in free-stream conditions given below, considering that the propagation of these independent measurement errors is closely approximated by a Taylor series expansion.

		Uncertainty, percent (±)				
Nominal M_∞	Nominal $Re_d \times 10^{-6}$	M_∞	p_{t_∞}	p_∞	q_∞	Re_d
0.2	0.5	1.9	0.5	0.5	3.7	2.0
0.4	0.5, 1.0	0.7	0.5	0.5	1.3	1.0
0.6	0.5, 1.0	0.3	0.5	0.5	0.7	0.8
0.8	0.5	0.2	0.5	0.5	0.6	0.8
1.5	0.5 to 1.5	0.7	0.5	1.5	0.5	0.9
1.75	1.0	0.7	0.5	1.8	0.7	0.9
2.0	0.5 to 1.5	0.5	0.5	1.6	0.8	1.0
2.25	1.0	0.5	0.5	1.6	0.8	1.0
2.5	1.0	0.3	0.5	1.3	0.8	0.9

The uncertainties listed below are for the aerodynamic coefficients obtained on the longest (L/d = 1.53) model at one Reynolds number, but are considered to be representative of the data for all configurations at all test conditions.

Nominal Test Conditions		x.xxx = Absolute Uncertainty (±) Near Minimum Load (x.xxx) = Percentage Uncertainty (±) at Maximum Load		
M_∞	$Re_d \times 10^{-6}$	C_N	C_m	C_{AT}
0.4	0.5	0.076 (6.04)	0.036 (20.19)	0.067 (6.42)
0.6	0.5	0.059 (3.54)	0.028 (14.39)	0.052 (4.33)
0.8	0.5	0.043 (2.57)	0.020 (16.43)	0.038 (3.27)
1.5	1.0	0.015 (0.78)	0.008 (8.10)	0.013 (0.95)
1.75	1.0	0.015 (0.91)	0.008 (9.08)	0.013 (1.05)
2.0	1.0	0.015 (0.96)	0.008 (11.48)	0.013 (1.09)
2.25	1.0	0.016 (1.11)	0.009 (13.43)	0.014 (1.24)
2.5	1.0	0.016 (1.00)	0.009 (14.59)	0.014 (1.13)

SECTION IV
RESULTS AND DISCUSSION

Because of the wide range of test variables in this investigation, only a few representative and summary plots are presented in this section. Data plots, which are self-explanatory, for the entire test matrix are presented in Appendix II. The data were computer plotted in body axes coefficients because the primary test objective was the longitudinal stability characteristics. Tabulated results, which include coefficients in the wind axes, are given in Appendix III. It should be noted that there has been no base pressure correction applied to these tabulated data or, except as noted, any of the plotted data presented in this report. Calculations of the correction for subsonic blockage, based on maximum projected model area, indicated a maximum change of ±2 percent in axial-force coefficient; consequently no blockage corrections have been applied to the data presented herein.

Flow-field photographs of the three configurations at M_∞ = 0.8 and 3.0 are given in Figs. 3 and 4, respectively. Those of Fig. 3 are schlieren; Fig. 4 includes both schlieren and shadowgraph. Representative curves of the longitudinal static stability and axial force as a function of angle of attack are shown in Fig. 5. The trends at M_∞ = 0.8 in Fig. 5a are typical of the subsonic results, and Fig. 5b for M_∞ = 2.0 is typical of the supersonic results. At M_∞ = 0.8 there was a small increase in total axial force as L/d was decreased and a negative total axial force was measured at some test conditions on all models at angles of attack between about 80 and 90 deg. This latter result occurred at all subsonic Mach numbers with the longest model in general giving the most negative value of C_{AT}.

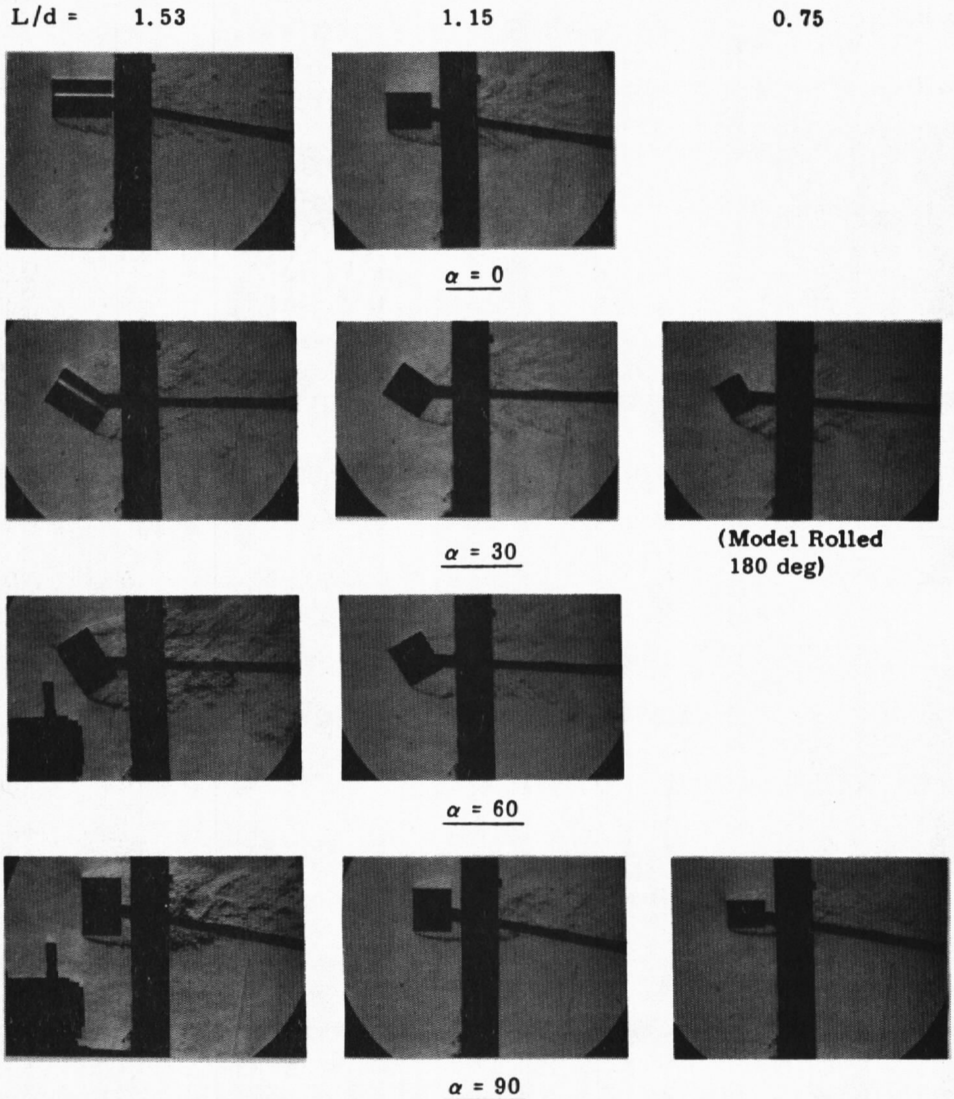


Fig. 3 Flow-Field Photographs at M_∞ = 0.8, Re_d = 0.5 x 10^6

At these attitudes, of course, C_{AT} is more representative of a lifting force and reflects the pressure loading on the ends of the cylinder. The normal-force coefficients as a function of angle of attack show a rather unusual trend in that C_N remained essentially zero (within the precision of measurement) until α reached at least 10 deg. The region of zero normal force increased with a decrease in L/d at all subsonic Mach numbers. This trend is probably a result of the flow separation around the cylinder and the location of the flow reattachment, if it occurs at all, on these short cylinders. As L/d was decreased the region of negative pitching moment increased, and the absolute level of the moment was reduced. The typical supersonic data presented in Fig. 5b show that the three cylinders produced results that would be expected, i.e., very little difference in total axial force and a general decrease in C_N and C_m as L/d was decreased.

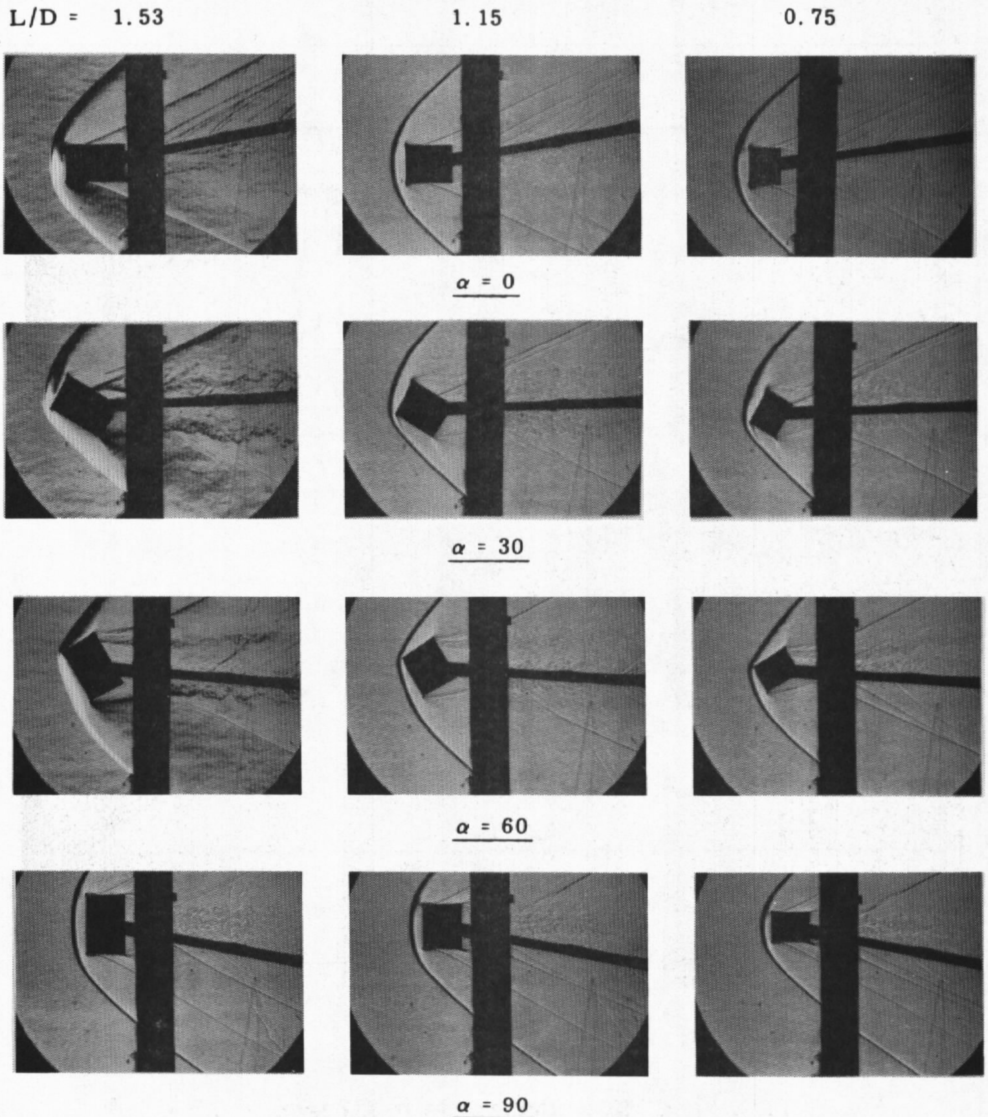
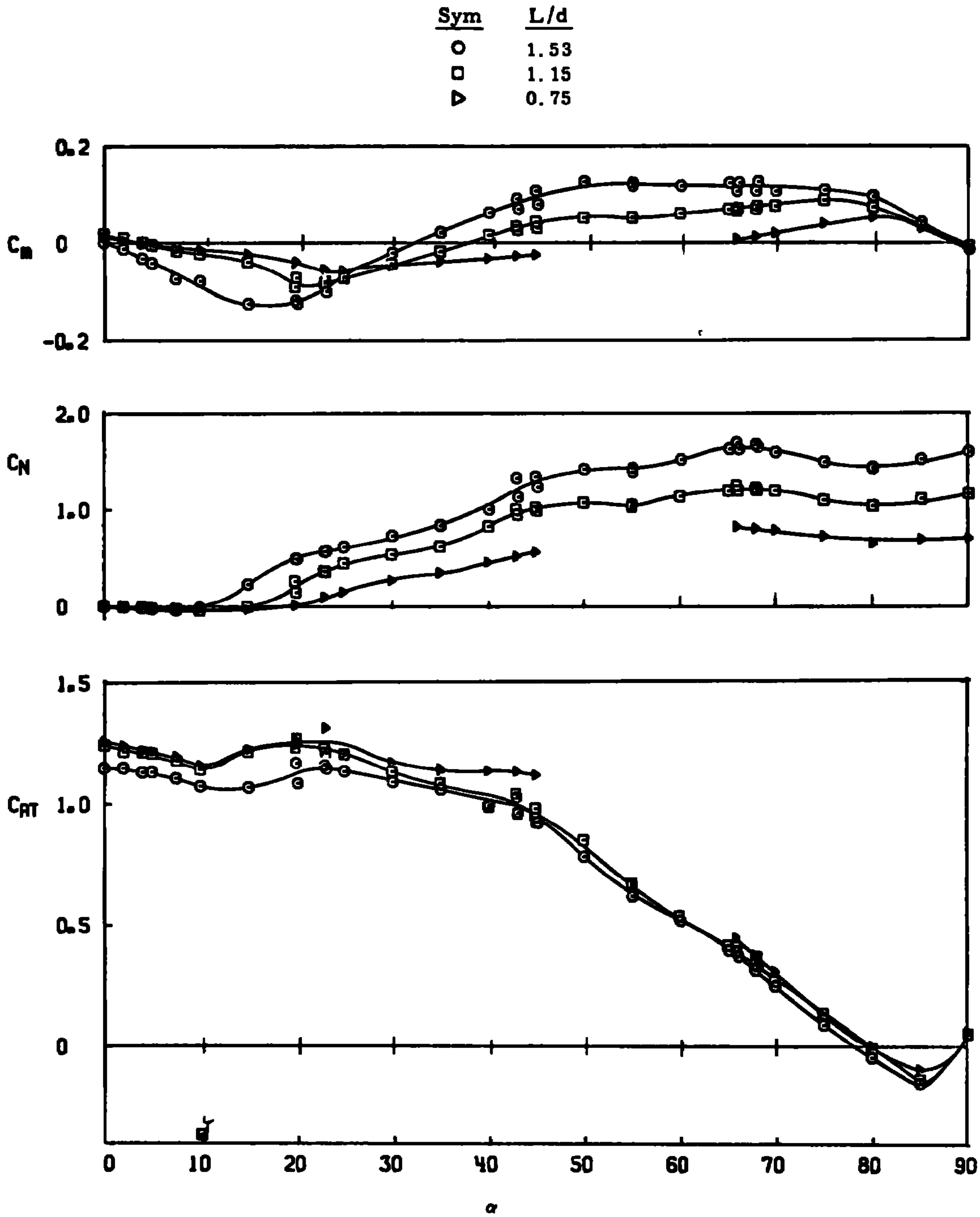
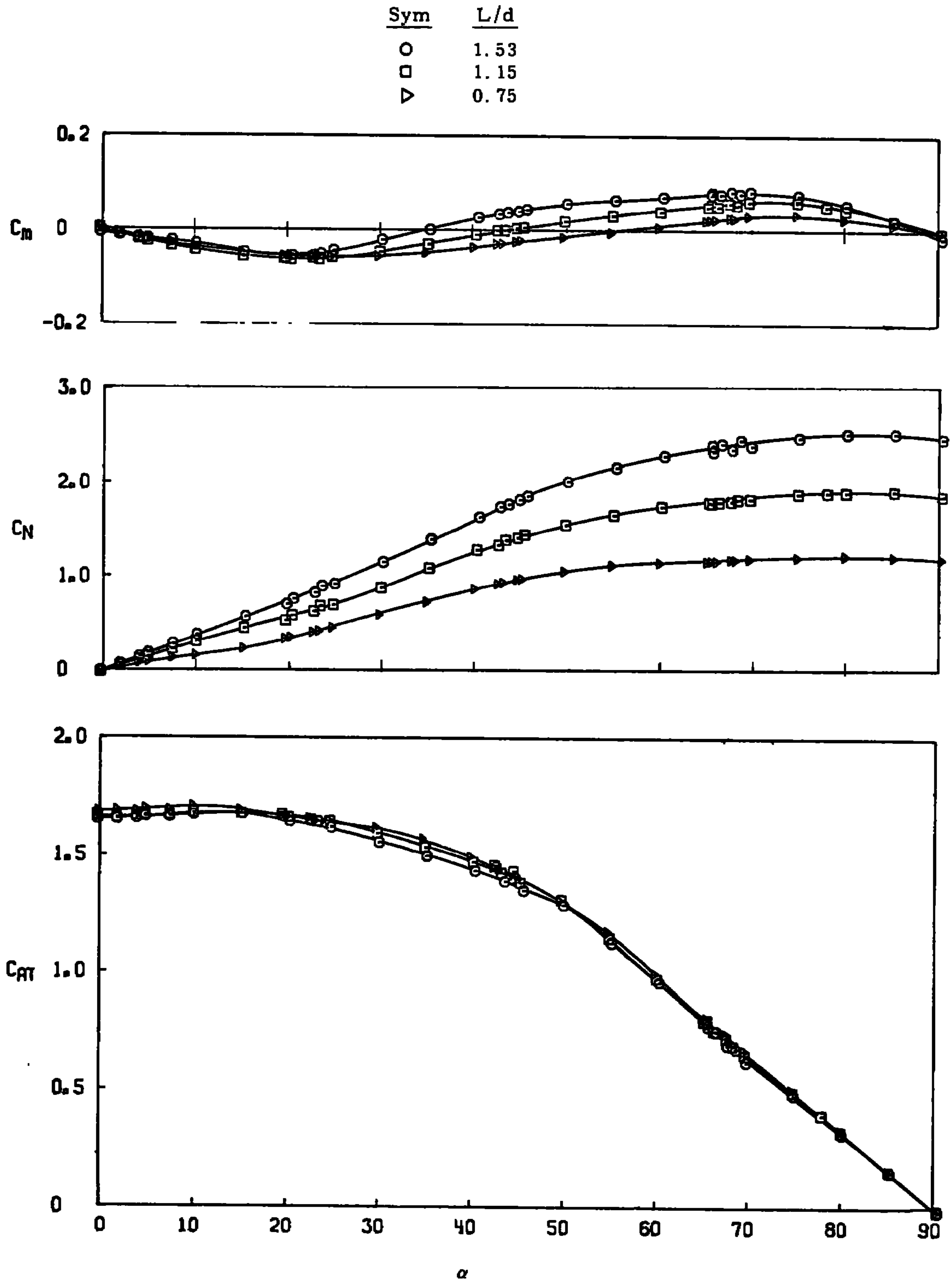


Fig. 4 Flow-Field Photographs at M_∞ = 2.0, Re_d = 1.0 x 10^6



a. $M_\infty = 0.8$, $Re_d = 0.5 \times 10^6$
Fig. 5 Typical Longitudinal Stability and Axial Force as a Function of Angle of Attack



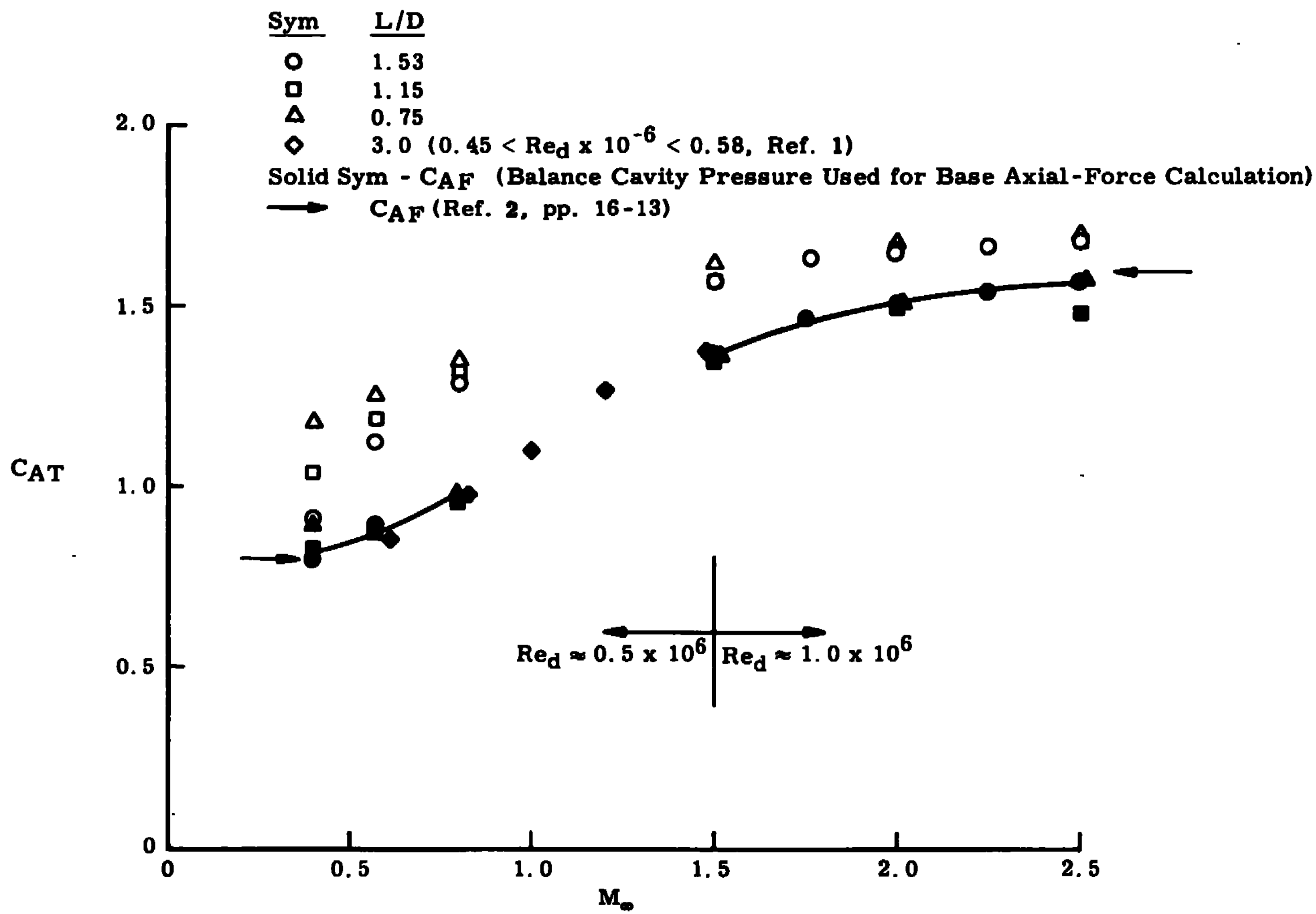
b. $M_\infty = 2.0$, $Re_d = 1.0 \times 10^6$

Fig. 5 Concluded

Data are presented in Fig. 6 for the stability and axial-force coefficients as a function of Mach number at α = 0, 45, and 90 deg. Both total and forebody axial-force coefficients are given for α = 0 in Fig. 6a, and show the significance of the base-pressure correction particularly at the subsonic speeds in the trends of the axial-force data with Mach number and L/d. Even though there is a fairly large variation in L/d, the present data compare very well with the transonic results of Ref. 1 and the levels at M_∞ = 0.4 and 2.5 from Ref. 2. The results for α = 45 in Fig. 6b clearly show the decrease in normal force and pitching moment as L/d was decreased at all Mach numbers. At α = 90 the normal-force data (Fig. 6c) which are of course the drag coefficient for an upright cylinder, show a large decrease when the Reynolds number was increased in the subsonic range, a result, as shown in Ref. 2, of boundary-layer transition. There was no effect of a Reynolds number change for the long cylinder in the supersonic range. These data show, as would be expected, a sizeable decrease in the force coefficient based on the circular area as L/d was reduced. This apparent effect of L/d is eliminated, however, when the coefficient is based on the frontal area (see inset on Fig. 6c).

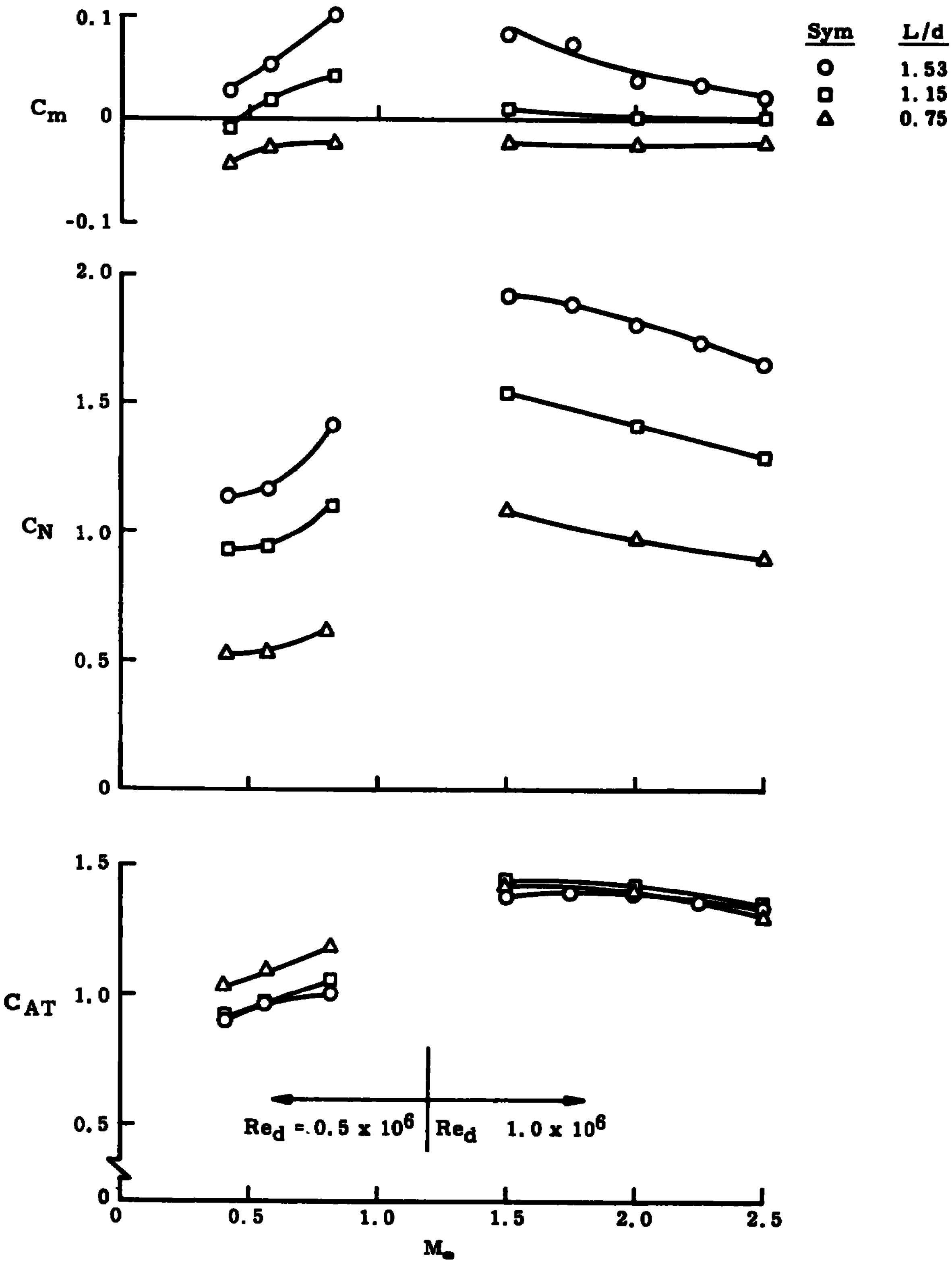
Data from the present test obtained at low angles of attack and M_∞ = 0.4 are compared, in Fig. 7, with results from Ref. 3 as a function of L/d. Although the two sets of data were obtained at significantly different Reynolds numbers, the general trends are in relatively good agreement. The total axial-force data indicate that as L/d is decreased, a minimum value, which is also a function of pitch angle, is reached and a further decrease in L/d results in an increase in total axial force. These results should be viewed with care, however, because of the very significant effects of base pressure on the axial-force measurement (see Fig. 6a). Unfortunately, base-pressure corrections were not given in Ref. 4. This word of caution can of course be extended to all these results in that there must be some effects of the sting support present, to varying degrees, depending on the sting model configurations with respect to the free-stream flow direction over the pitch range. Also shown on this figure is a comparison between the forebody axial force at α = 0 and the data fairing reproduced from Ref. 2.

The normal-force data as a function of L/d again show the zero or negative values for the shorter models at positive angles of attack. The agreement of the present data with that of Ref. 2 at a much higher Reynolds number indicates that these trends are, in general, independent of Reynolds number over a wide range. The pitching-moment data, Fig. 7c, appear to be quite sensitive to Reynolds number; however, the general trends as a function of L/d are similar between the present data and those of Ref. 2. The data of Ref. 2 have been recalculated to account for the difference in the moment reference point.



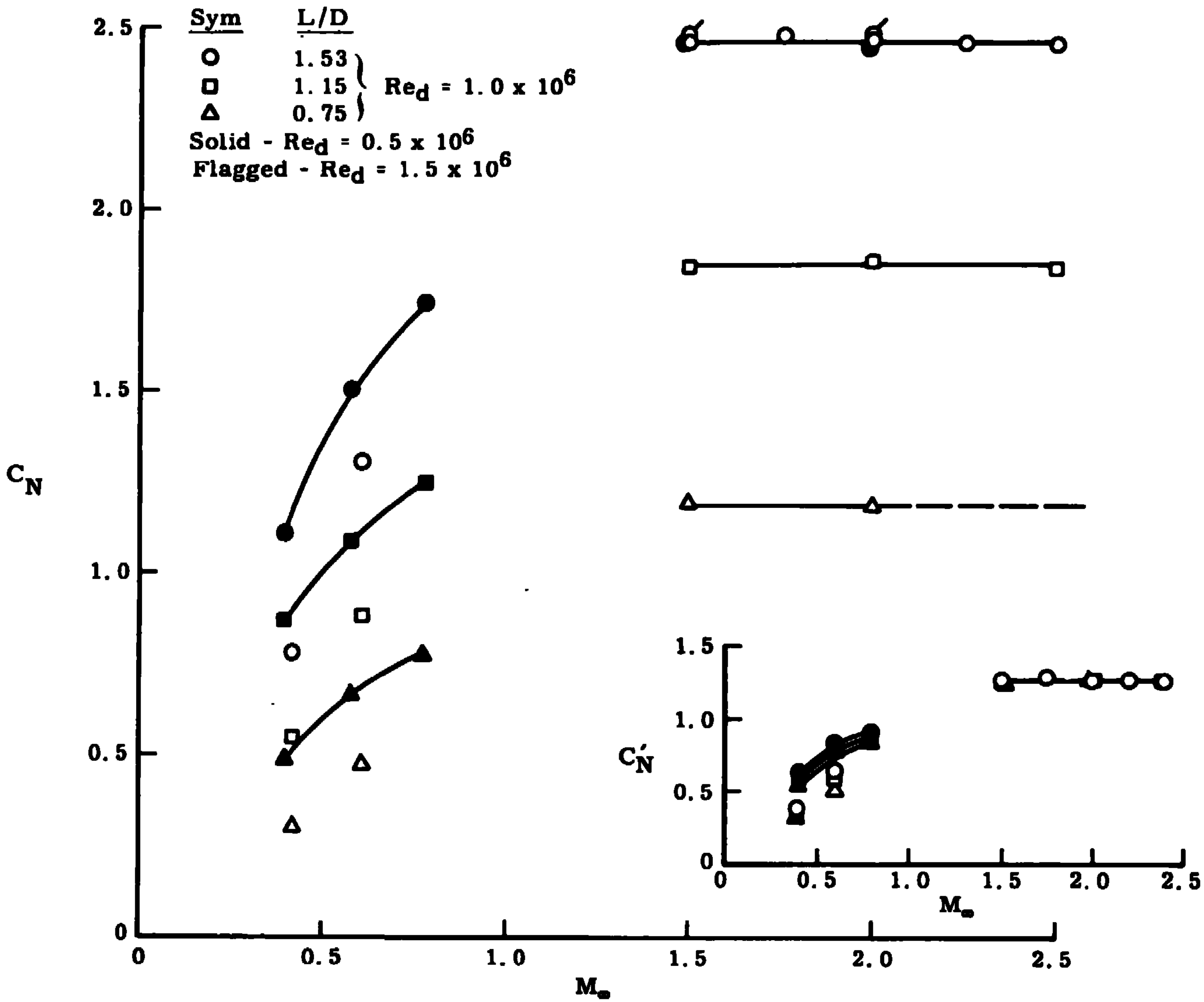
a. $\alpha = 0$

Fig. 6 Effect of Mach Number on Longitudinal Stability and Axial Force



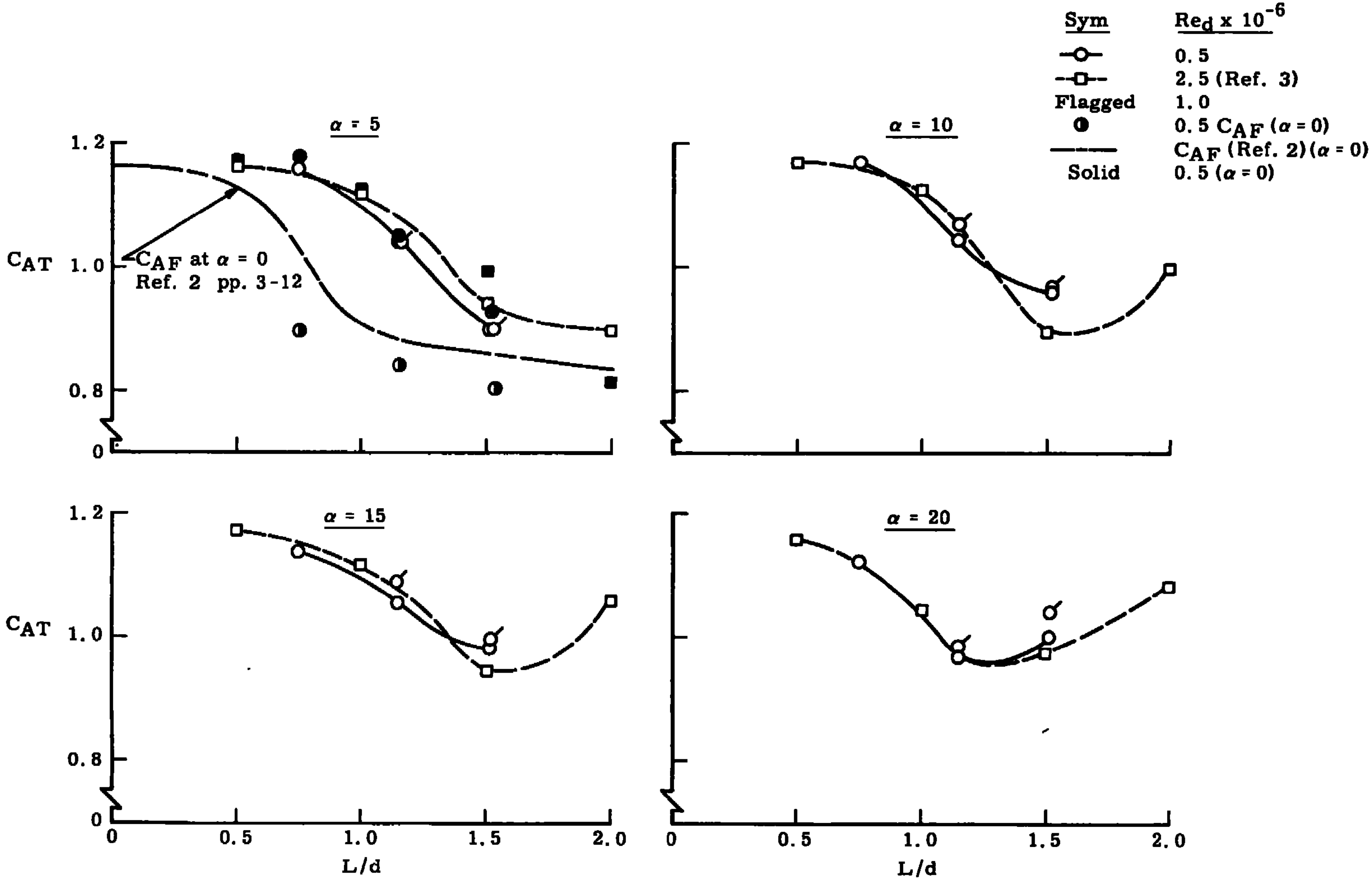
b. α = 45

Fig. 6 Continued



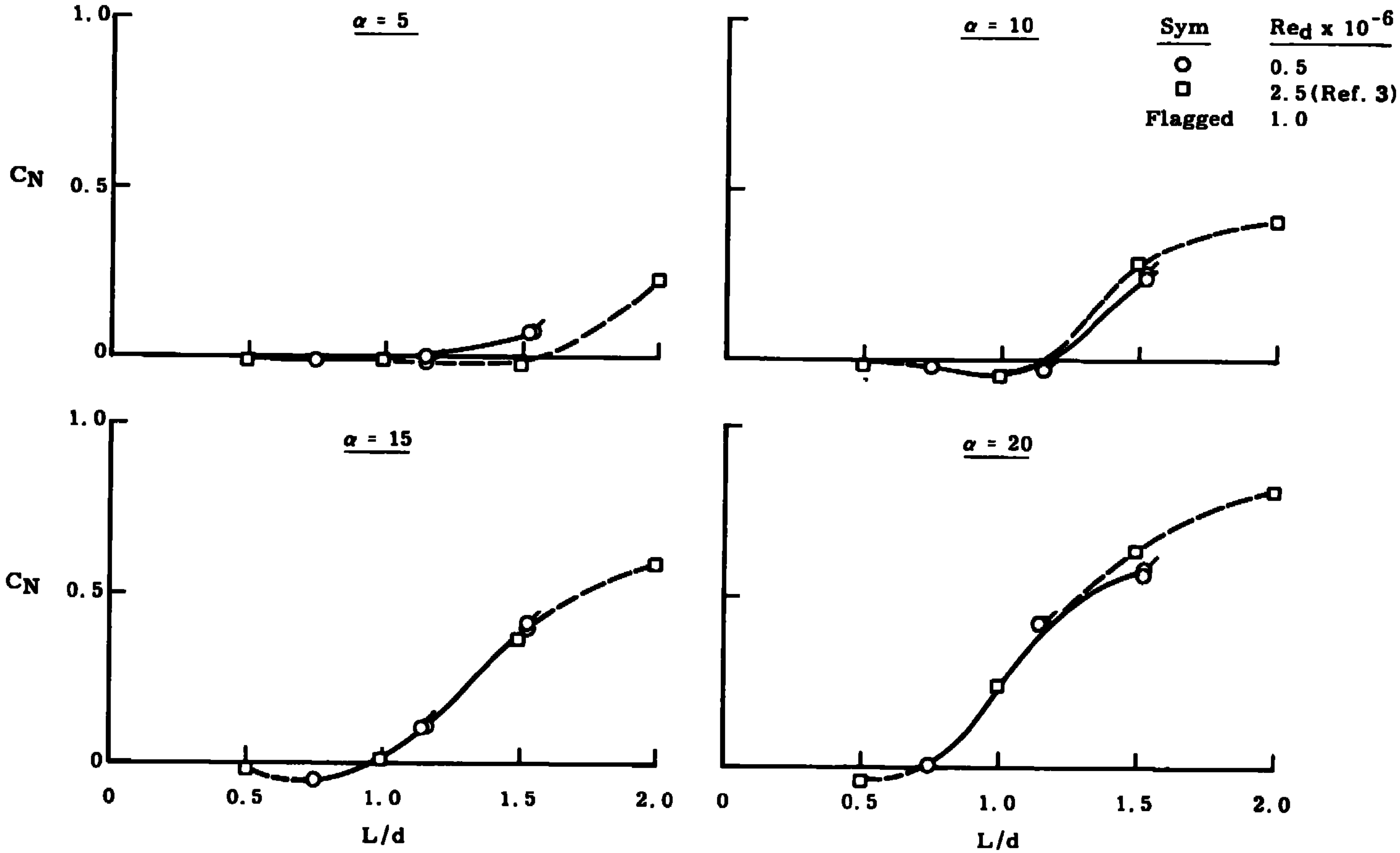
c. α = 90

Fig. 6 Concluded



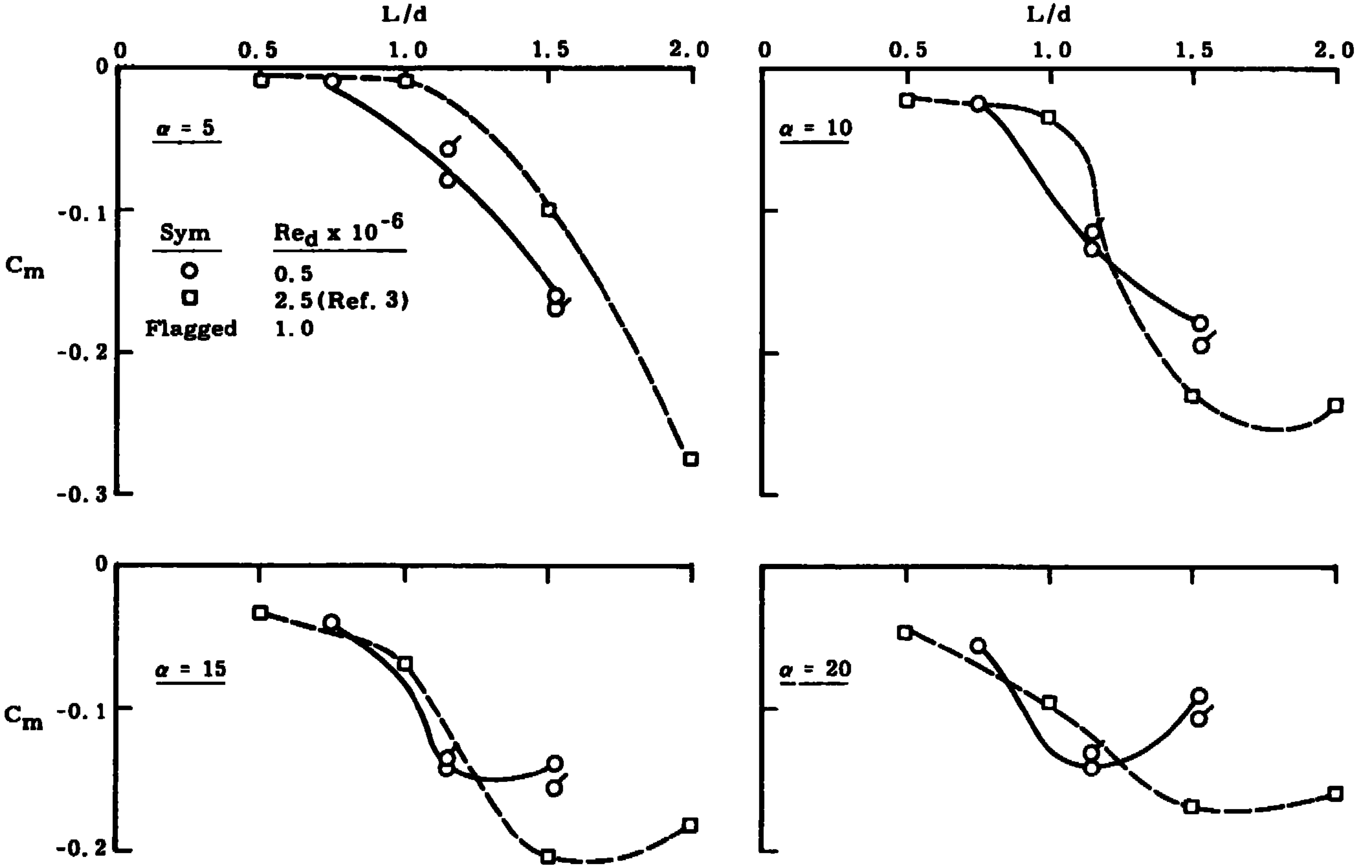
a. C_{AT}

Fig. 7 Effect of L/d on Longitudinal Stability and Axial Force at $M_\infty = 0.4$, $0 \leq \alpha \leq 20$



b. C_N

Fig. 7 Continued



c. C_m
Fig. 7 Concluded

SECTION V
CONCLUDING REMARKS

The results of particular significance derived from this experimental investigation of the static stability and axial-force characteristics of short cylinders may be summarized as follows:

1. At subsonic speeds, a model base-pressure correction significantly altered the relative magnitudes of axial-force coefficients at zero angle of attack and improved the data comparison.

2. Zero or slightly negative normal force was observed for pitch angles as high as 20 deg (L/d = 0.75) in the subsonic range.

3. Good agreement was obtained for the forebody axial force at zero angle of attack between the present data and reference data in the transonic range.

4. The same general trends with cylinder L/d were observed in the stability data at $M_\infty = 0.4$ and $0 \leqslant \alpha \leqslant 20$ as obtained in a previous investigation at much higher Reynolds numbers.

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2. Hoerner, Sighard F. "Fluid-Dynamic Drag." Published by the author, 1958.

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APPENDIXES

I. TEST SUMMARY TABLES

II. DATA PLOTS FOR ENTIRE TEST RANGE

III. TABULATED DATA

TABLE I
TEST CONDITIONS

Nominal M_∞	Calibrated M_∞	$Re_d \times 10^{-6}$	$p_{t\infty}$, psia	p_∞, psia	q_∞, psia	$T_{t\infty}$, °R
0.2	0.20	0.5	16.3	15.85	0.44	560
0.4	0.41	0.5	8.6	7.66	0.90	560
0.4	0.42	1.0	17.1	15.15	1.87	560
0.6	0.57	0.5	6.3	5.05	1.15	560
0.6	0.61	1.0	12.5	9.72	2.53	560
0.8	0.82	0.5	5.3	3.41	1.60	560
1.5	1.50	0.5	5.3	1.44	2.27	565
1.5	1.50	1.0	10.5	2.86	4.50	565
1.5	1.50	1.3	14.0	3.81	6.01	565
1.75	1.76	1.0	11.4	2.11	4.57	570
2.0	1.99	0.5	6.5	0.84	2.34	575
2.0	2.00	1.0	12.6	1.61	4.51	575
2.0	2.00	1.5	19.0	2.43	6.80	575
2.25	2.25	1.0	13.9	1.20	4.26	575
2.5	2.50	1.0	16.5	0.97	4.23	575

TABLE II
TEST MATRIX

MODEL CONFIGURATION CODE

XX-XX

θ

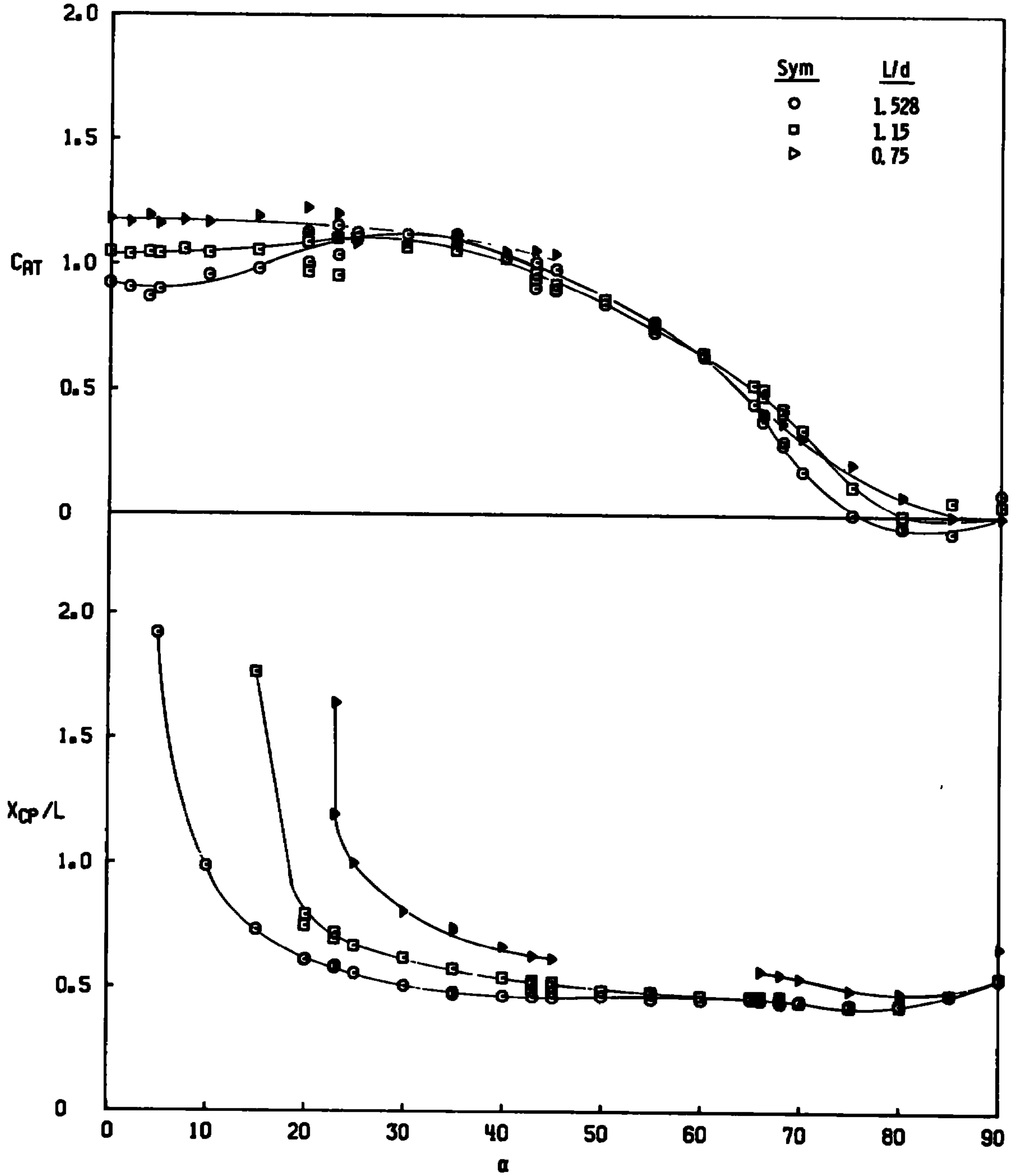
L/d

L/d Code
15 -(L/d = 1.528)
12 -(L/d = 1.15)
8 -(L/d = 0.75)

ϕ, deg	and α Range, deg
10	$-2 \leq \alpha \leq 23$
33	$20 \leq \alpha \leq 45$
56	$43 \leq \alpha \leq 68$
79	$66 \leq \alpha \leq 92$

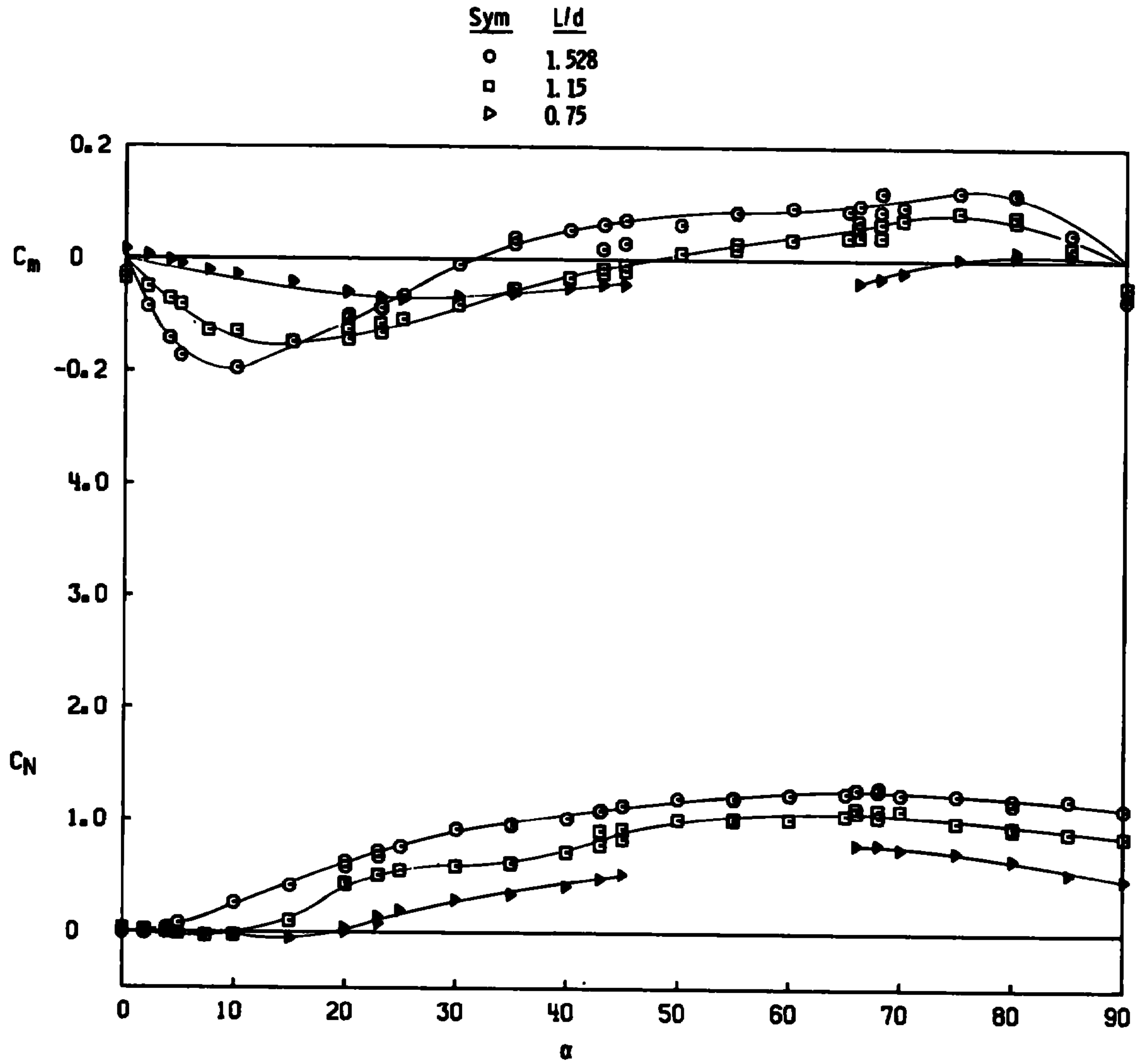
M_∞	$Re_d \times 10^{-6}$	Configuration											
		15-10	15-33	15-56	15-79	12-10	12-33	12-56	12-79	8-10	8-33	8-56	8-79
0.2	0.5	x	x	x	x								
0.4	0.5	x	x	x	x	x	x	x	x	x	x		x
0.4	1.0	x	x	x	x	x	x	x	x				x
0.6	0.5	x	x	x	x	x	x	x	x	x	x		x
0.6	1.0	x	x	x	x	x	x	x	x		x		x
0.8	0.5	x	x	x	x	x	x	x	x	x	x		x
1.5	0.5	x	x	x	x								
1.5	1.0	x	x	x	x	x	x	x	x	x	x	x	x
1.5	1.3	x	x	x	x								
1.75	1.0	x	x	x	x								
2.0	0.5	x	x	x	x								
2.0	1.0	x	x	x	x	x	x	x	x	x	x	x	x
2.0	1.5	x	x	x	x								
2.25	1.0	x	x	x	x								
2.5	1.0	x	x	x	x	x	x	x	x	x	x	x	

APPENDIX II
DATA PLOTS FOR ENTIRE TEST RANGE

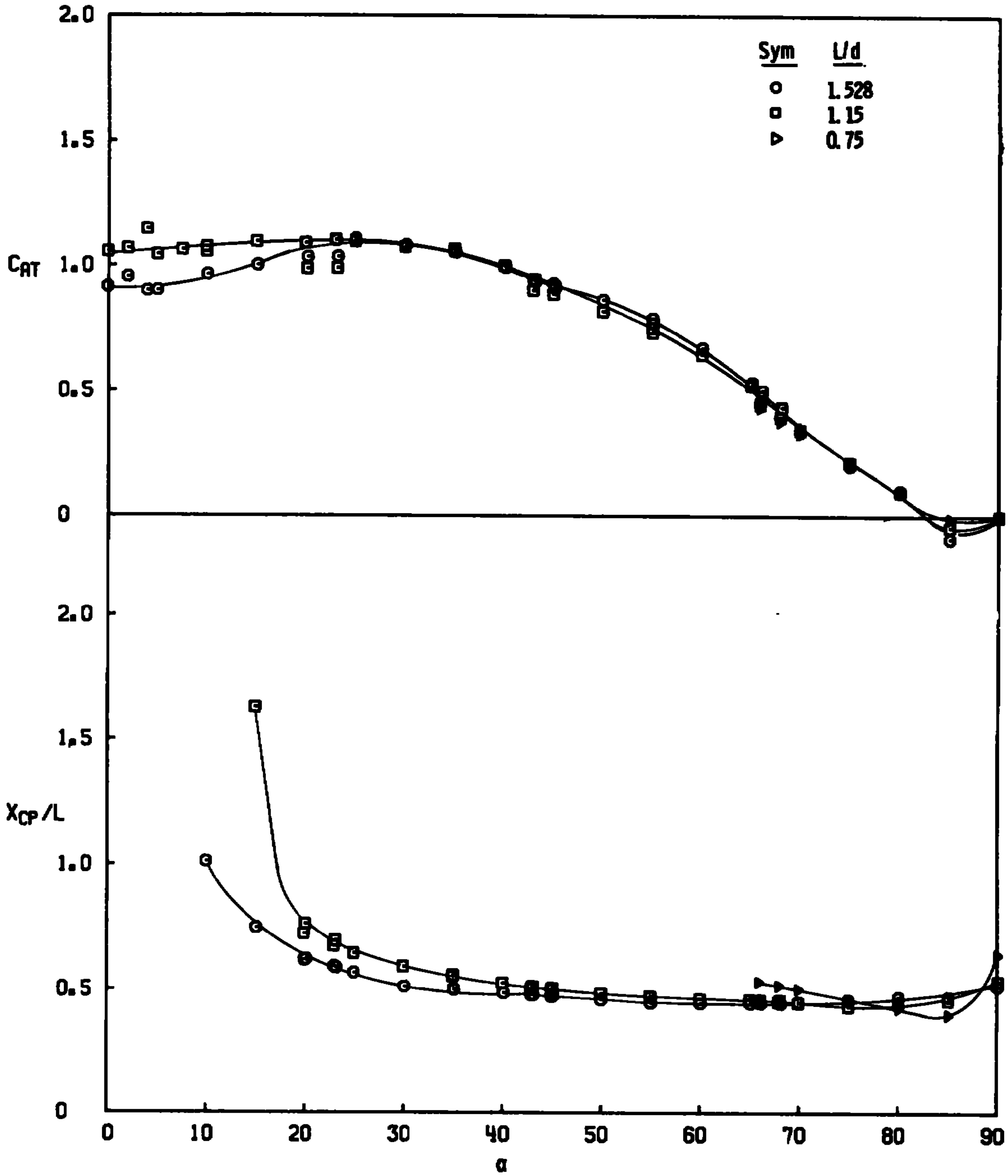


a. C_{AT} and X_{CP}/L versus α at $Re_d = 0.5 \times 10^6$

Fig. II-1 Stability Characteristics and Axial Force at $M_\infty = 0.4$

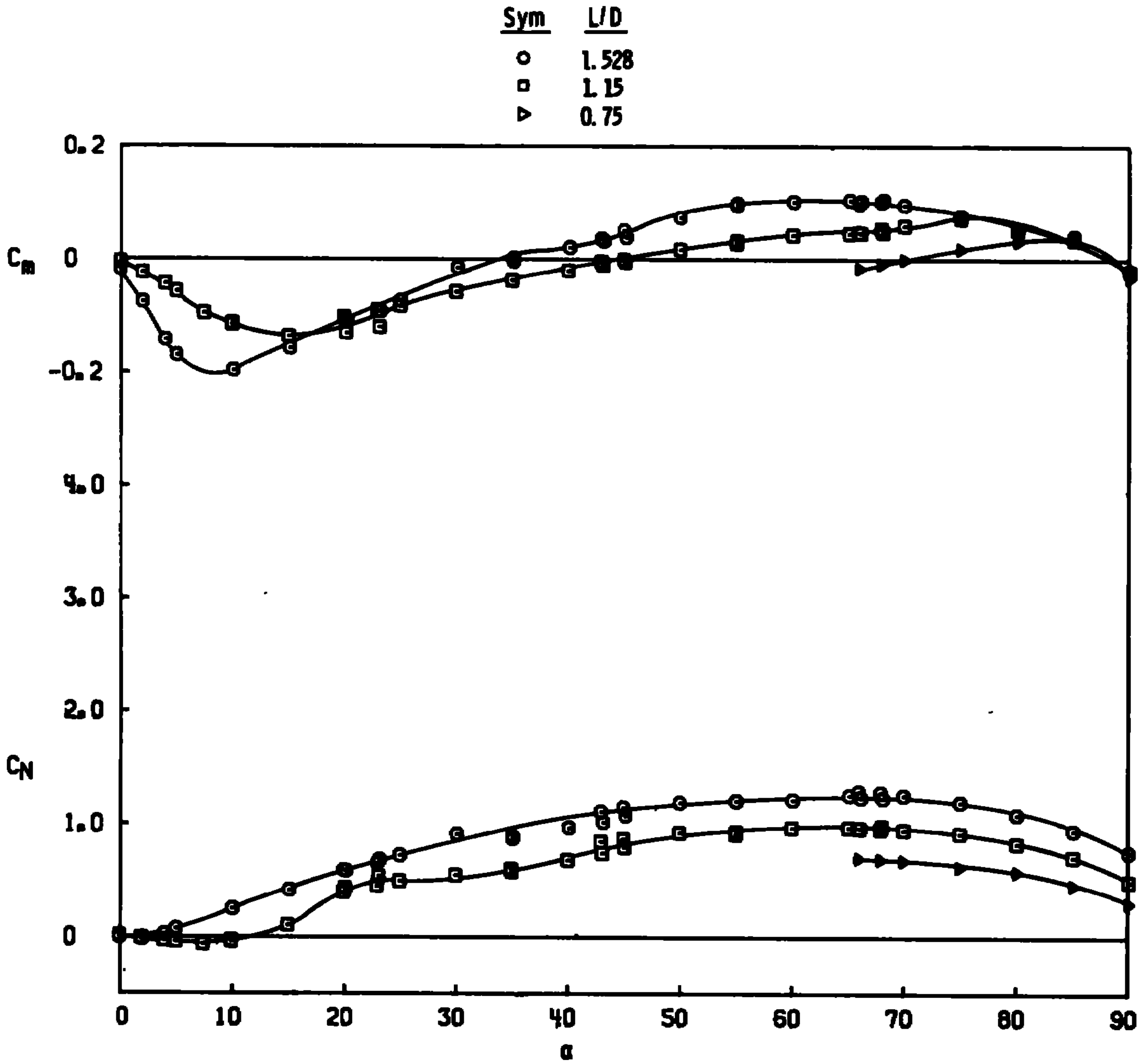


b. C_N and C_m versus α at $Re_d = 0.5 \times 10^6$
Fig. II-1 Continued

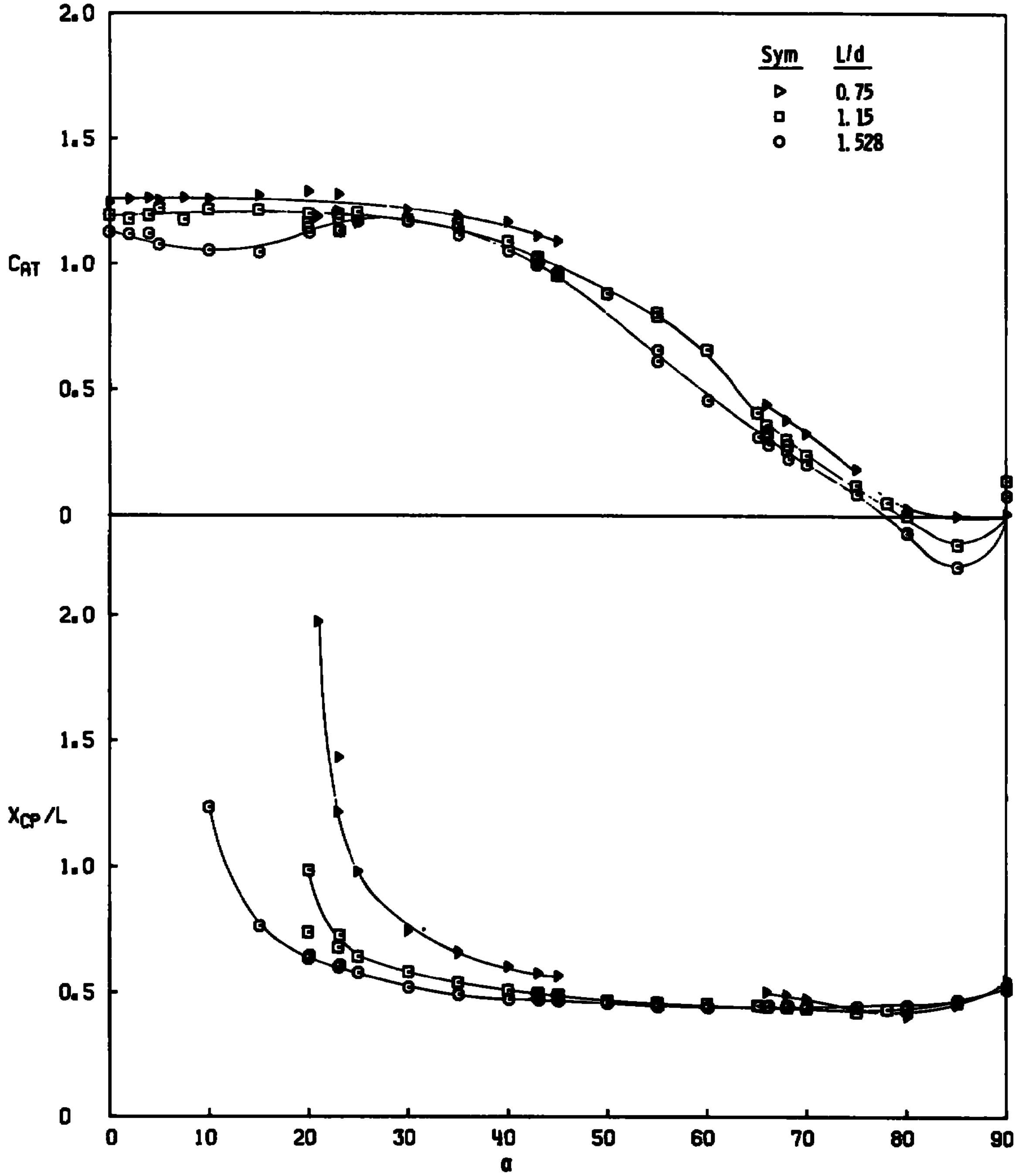


c. C_{AT} and X_{CP}/L versus α at $Re_d = 1.0 \times 10^6$

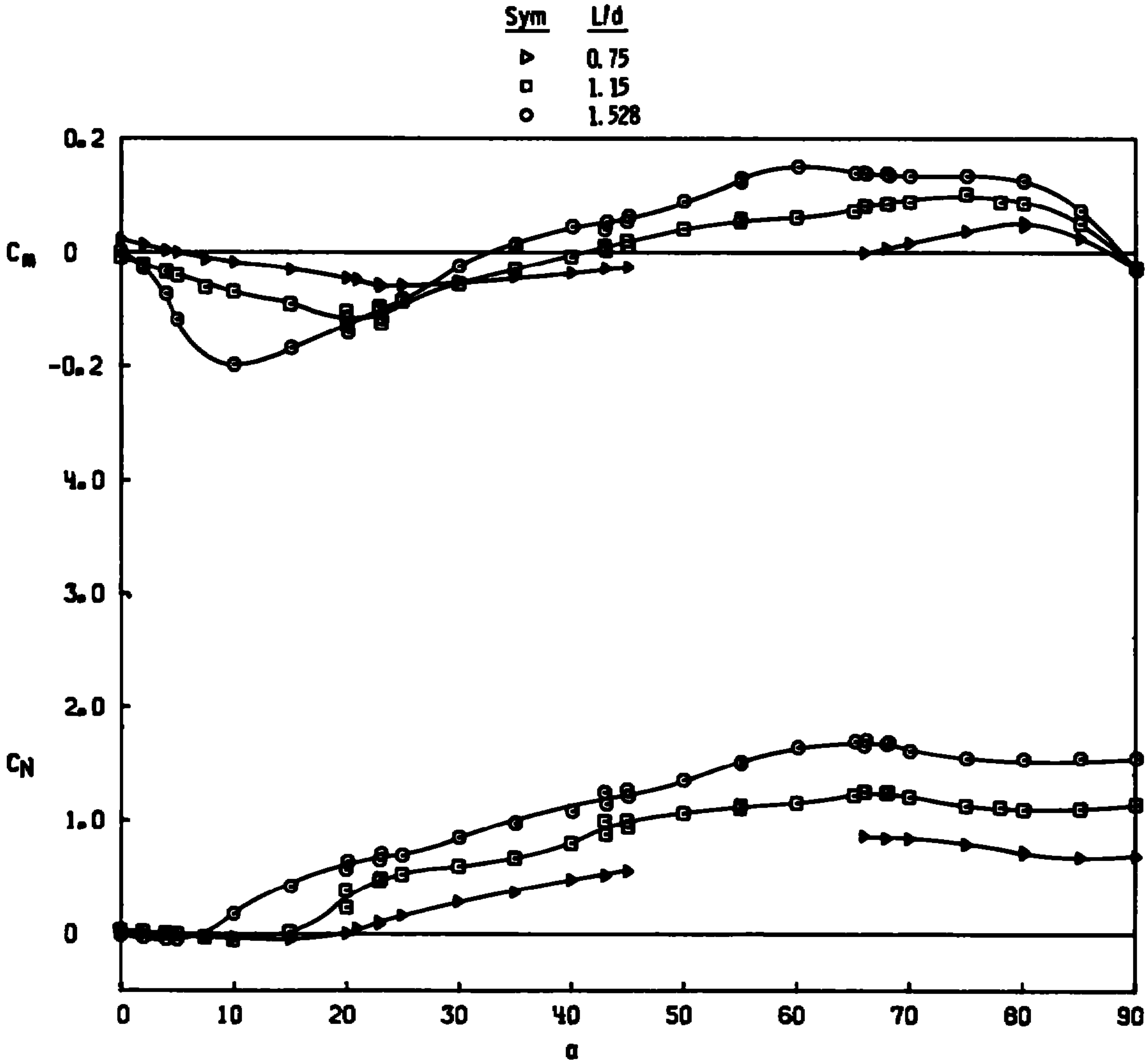
Fig. II-1 Continued



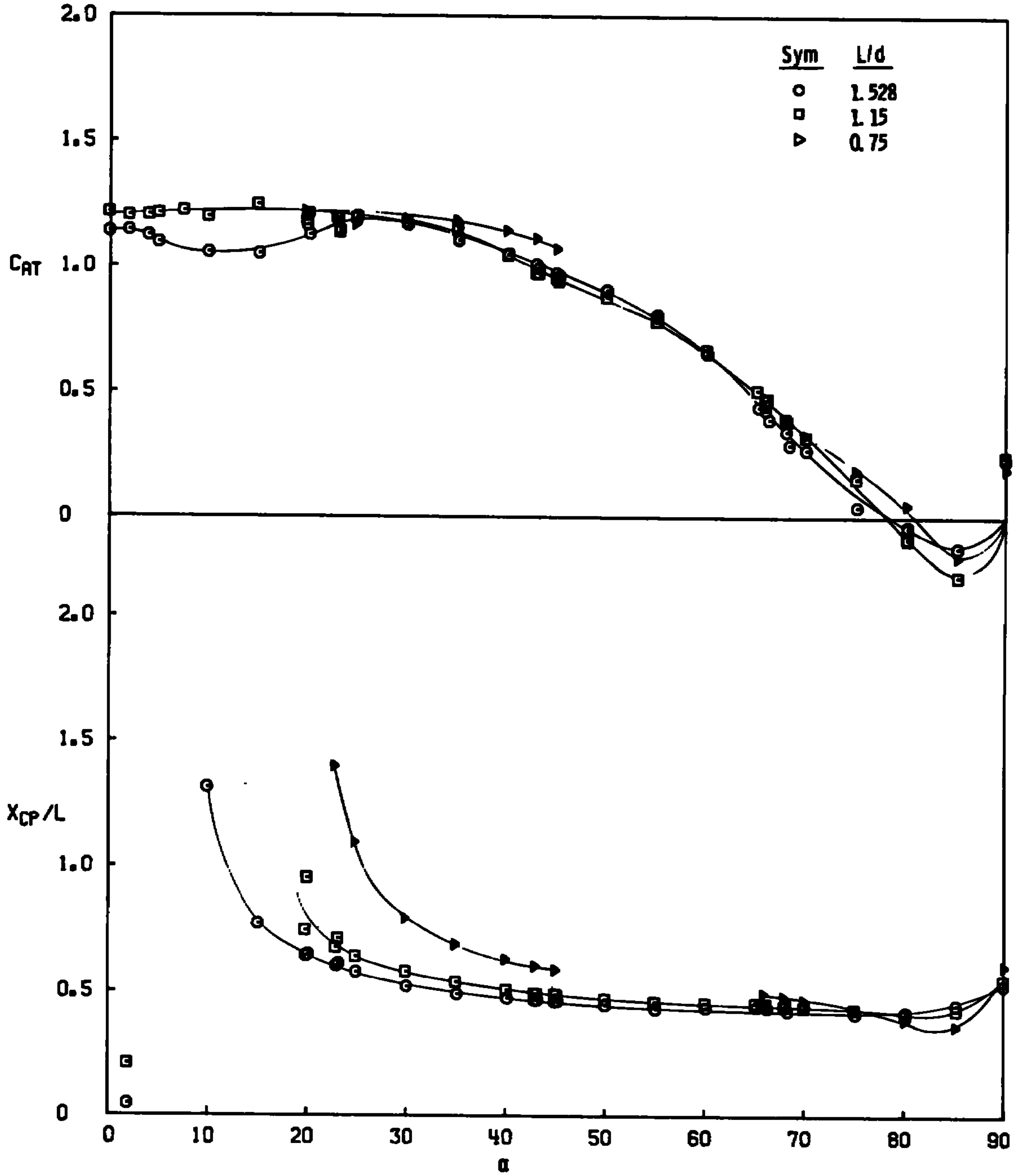
d. C_N and C_m versus α at $Re_d = 1.0 \times 10^6$
Fig. II-1 Concluded



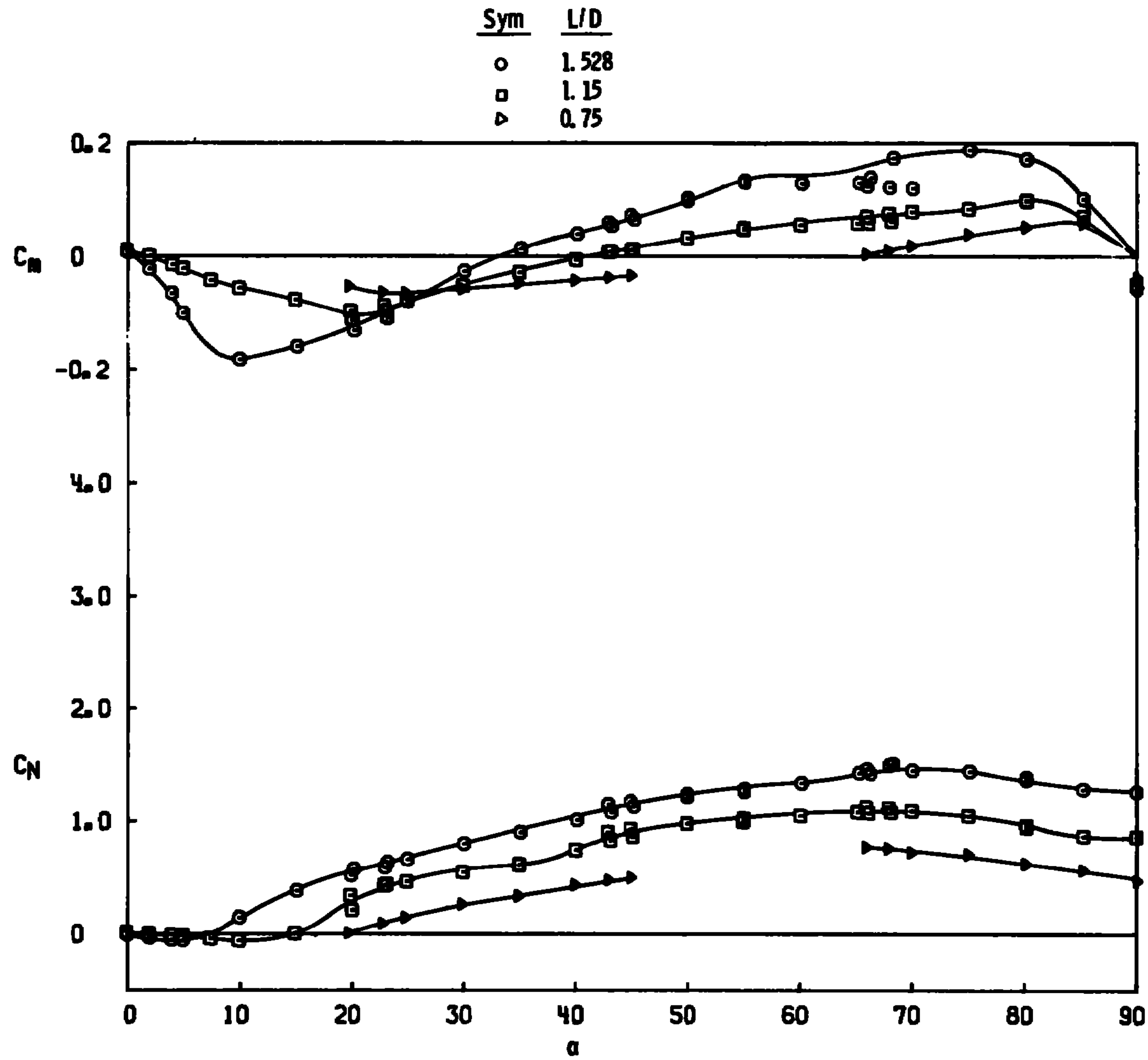
a. C_{AT} and X_{CP}/L versus α at $Re_d = 0.5 \times 10^6$
Fig. II-2 Stability Characteristics and Axial Force at $M_\infty = 0.6$



b. C_N and C_m versus α at $Re_d = 0.5 \times 10^6$
Fig. II-2 Continued

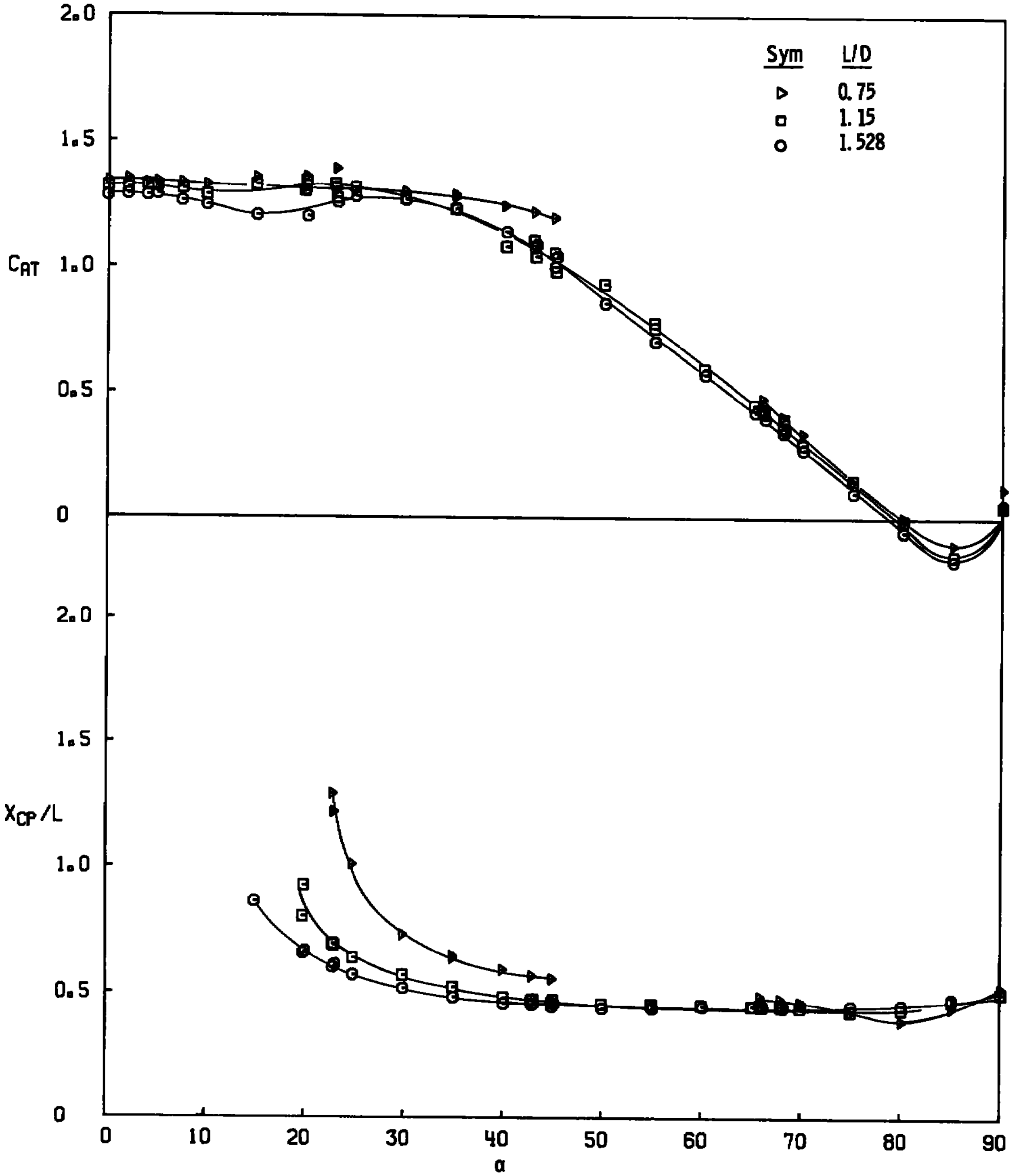


c. C_{AT} and X_{CP}/L versus α at $Re_d = 1.0 \times 10^6$
Fig. II-2 Continued



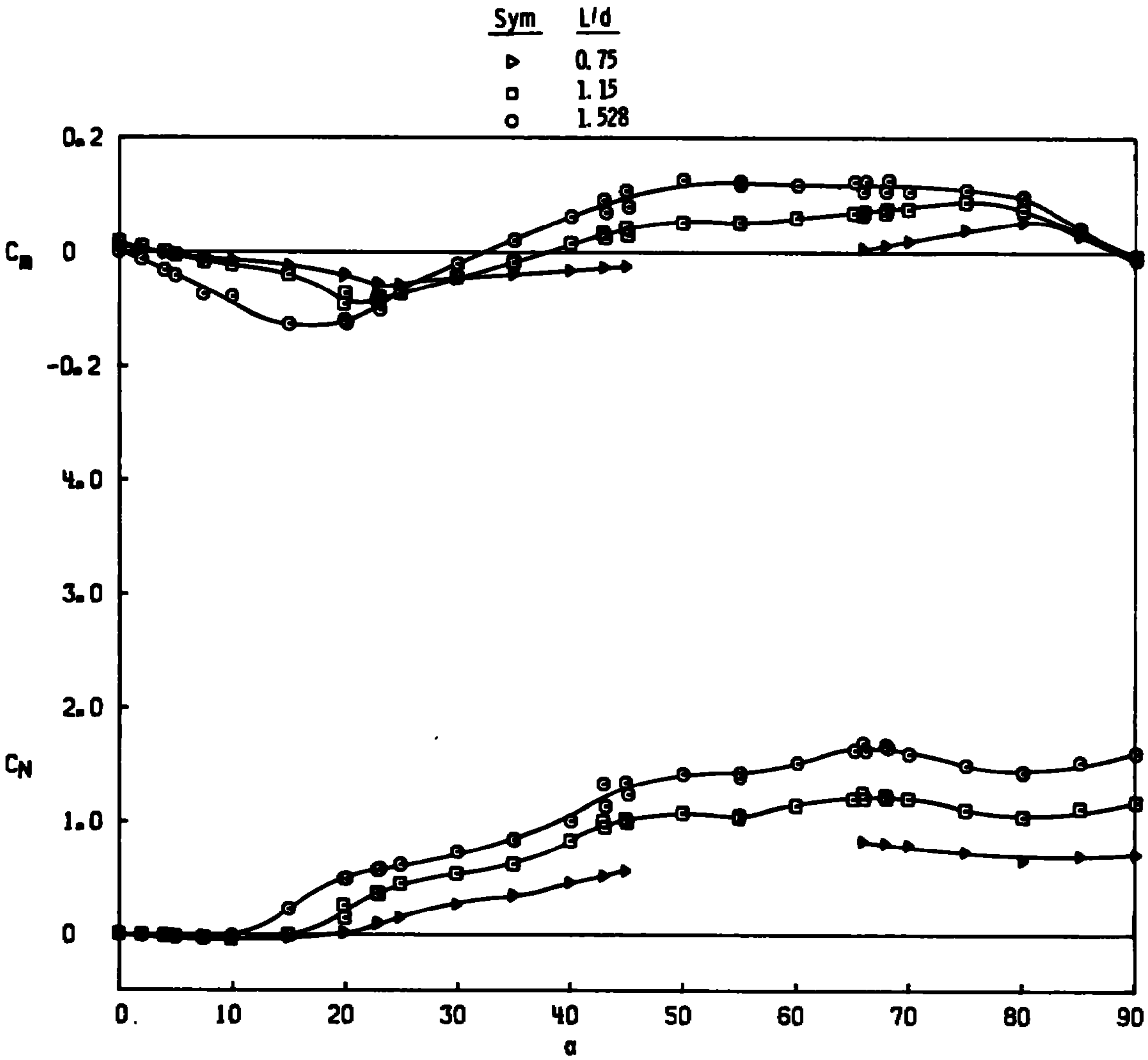
d. C_N and C_m versus α at $Re_d = 1.0 \times 10^6$

Fig. II-2 Concluded

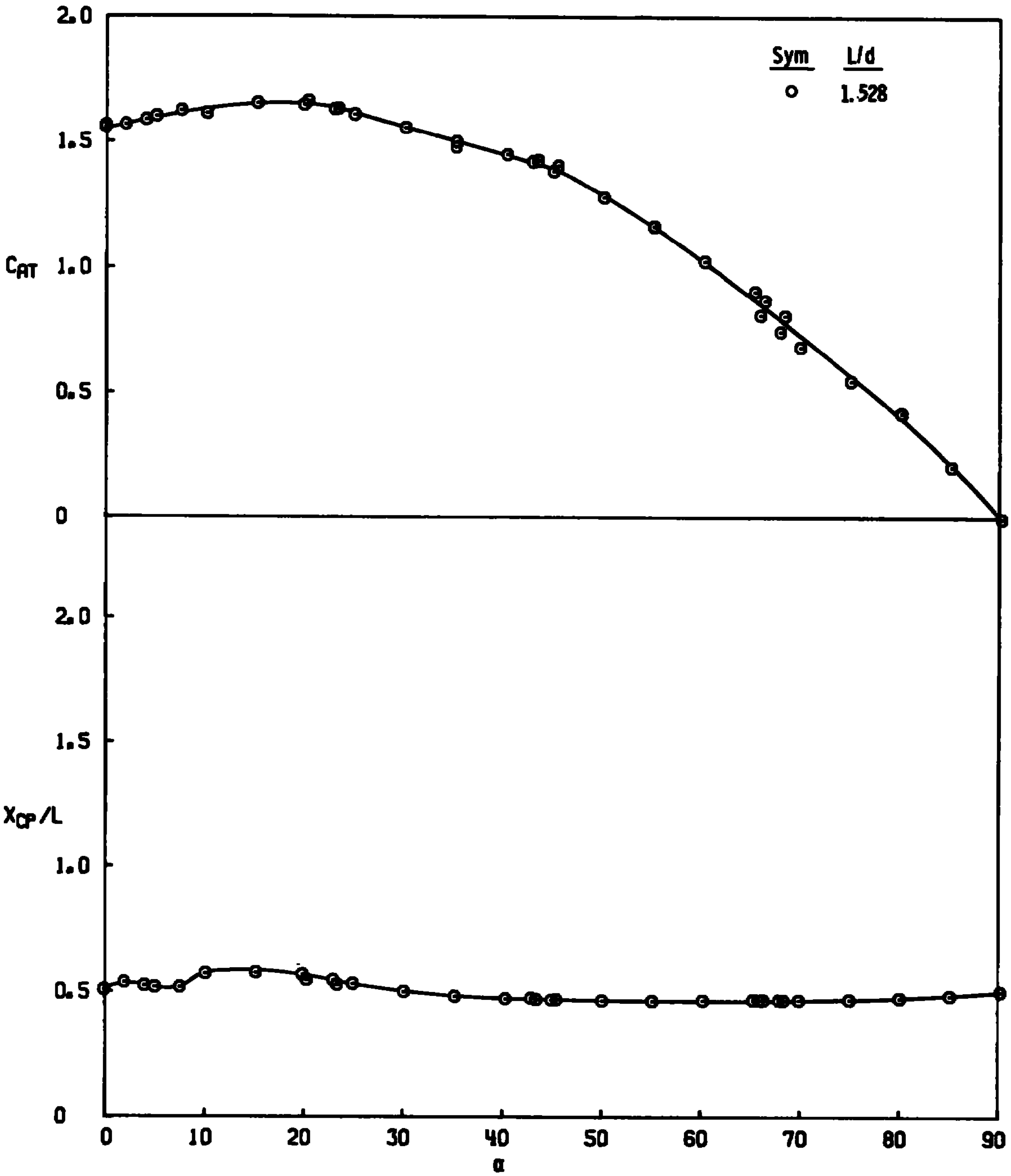


a. C_{AT} versus X_{CP}/L versus α

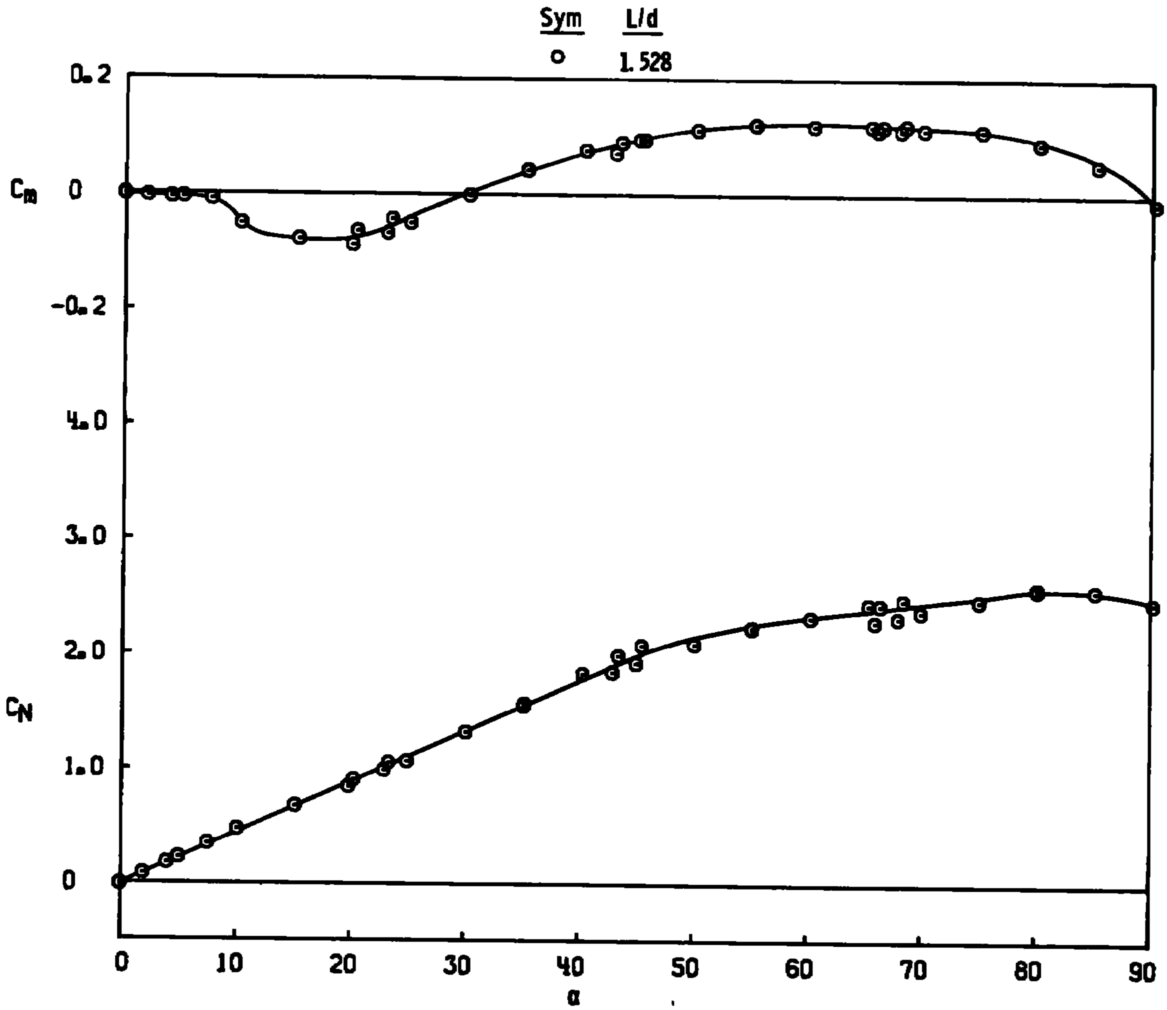
Fig. II-3 Stability Characteristics and Axial Force at $M_\infty = 0.8$, $Re_d = 0.5 \times 10^6$



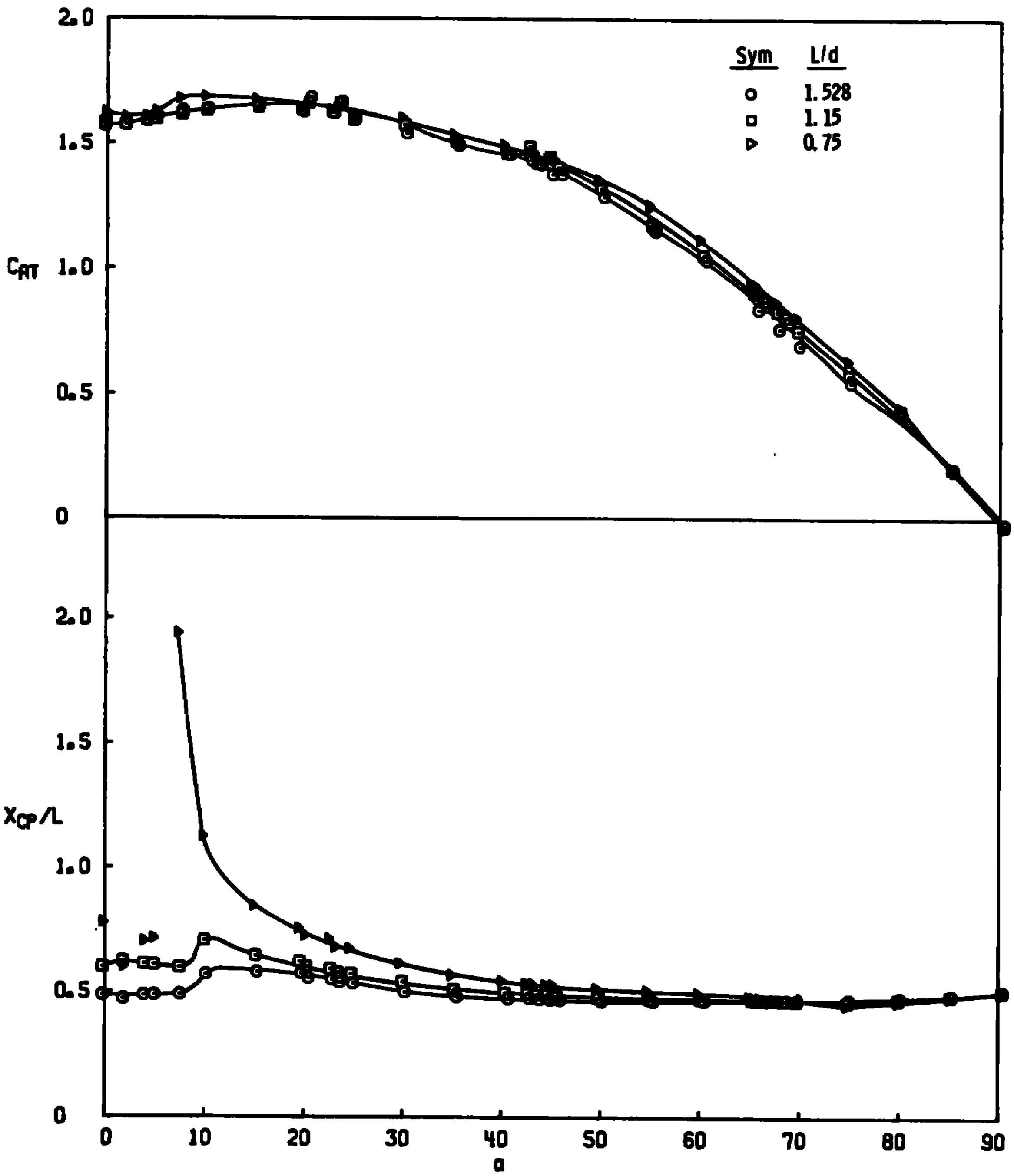
b. C_N and C_m versus α
Fig. II-3 Concluded



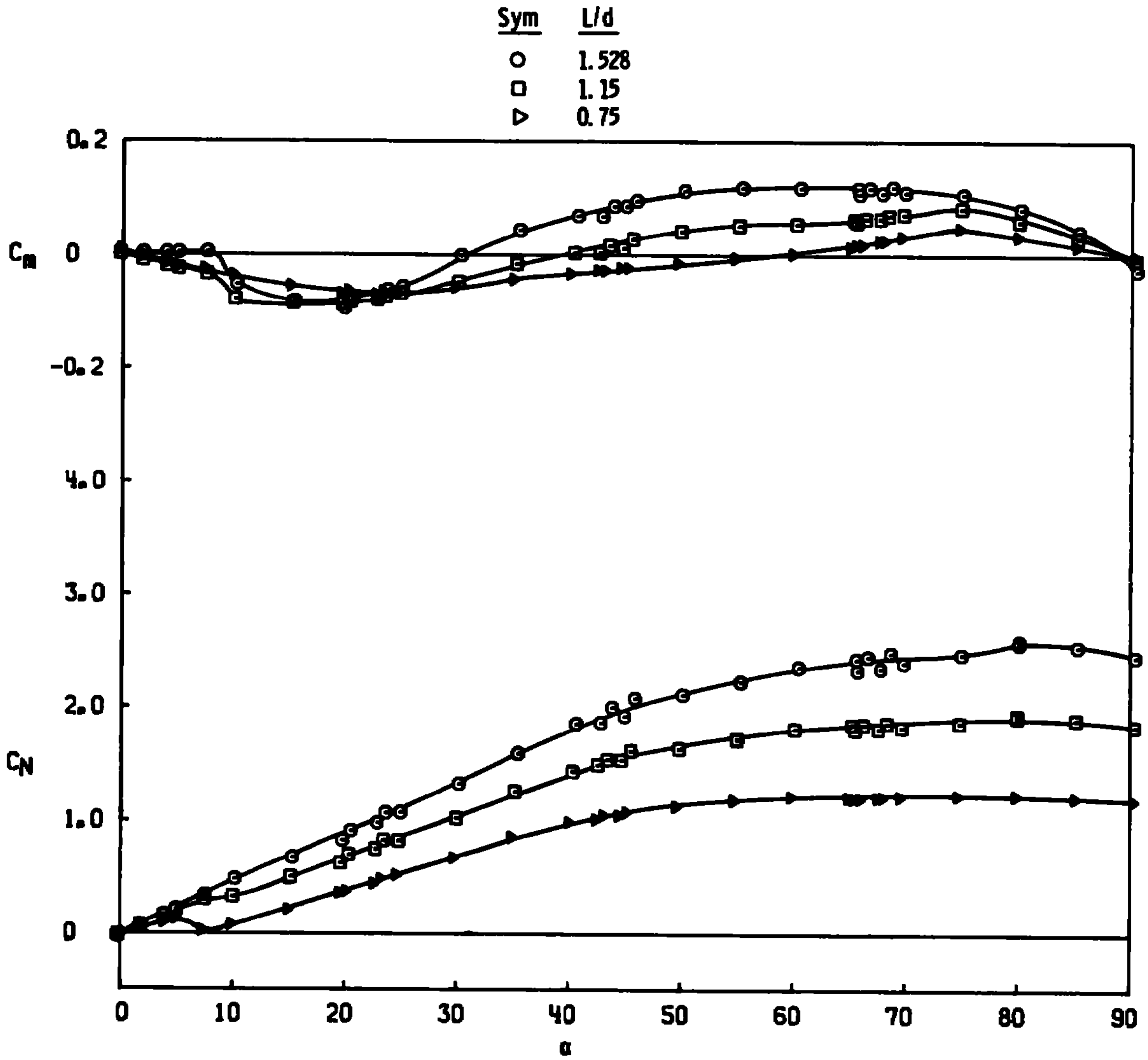
a. a. C_{AT} versus X_{CP}/L versus α at $Re_d = 0.5 \times 10^6$
Fig. II-4 Stability Characteristics and Axial Force at $M_\infty = 1.5$



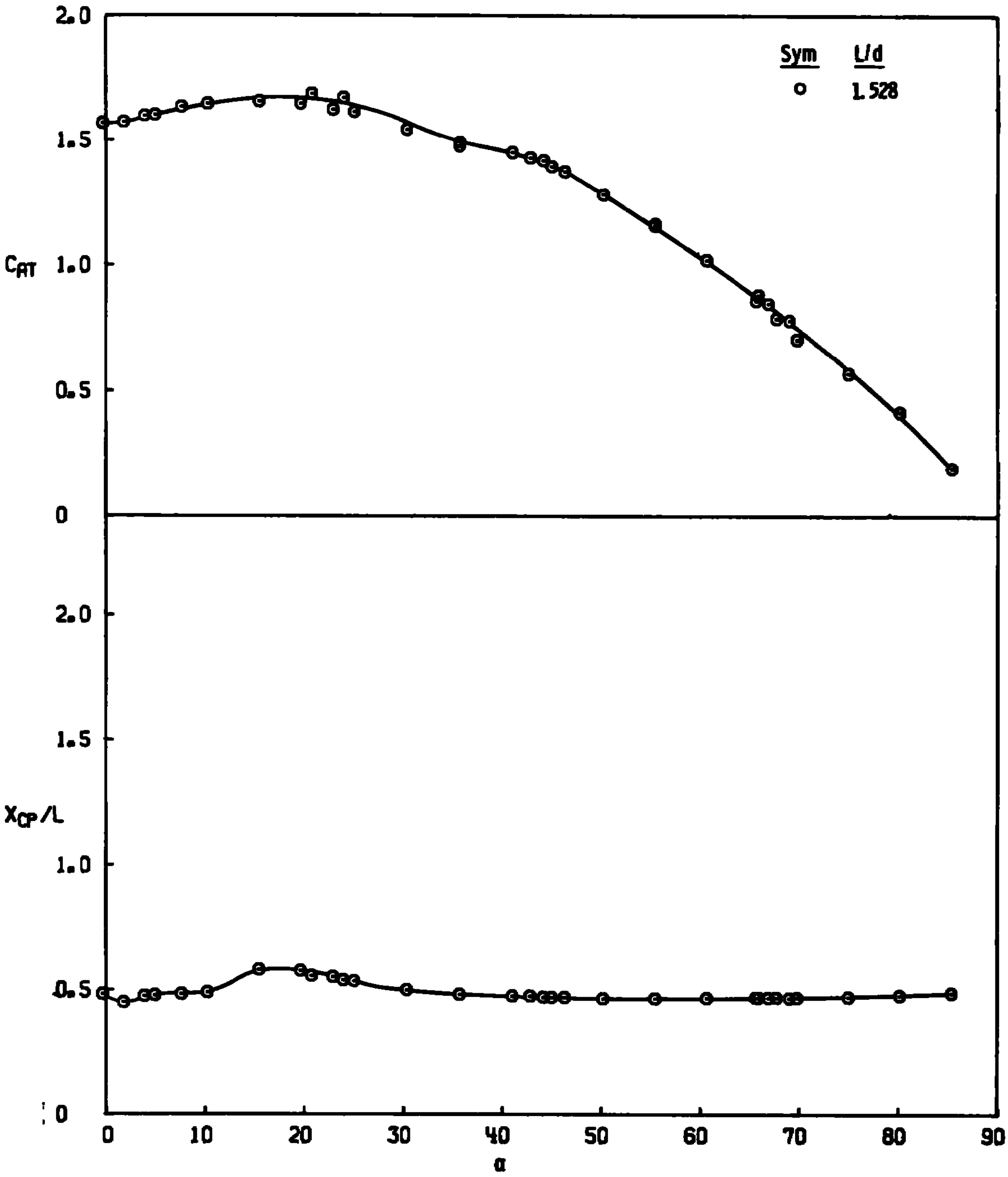
b. C_N and C_m versus α at $Re_d = 0.5 \times 10^6$
Fig. II-4 Continued



c. C_{AT} and X_{CP}/L versus α at $Re_d = 1.0 \times 10^6$
Fig. II-4 Continued

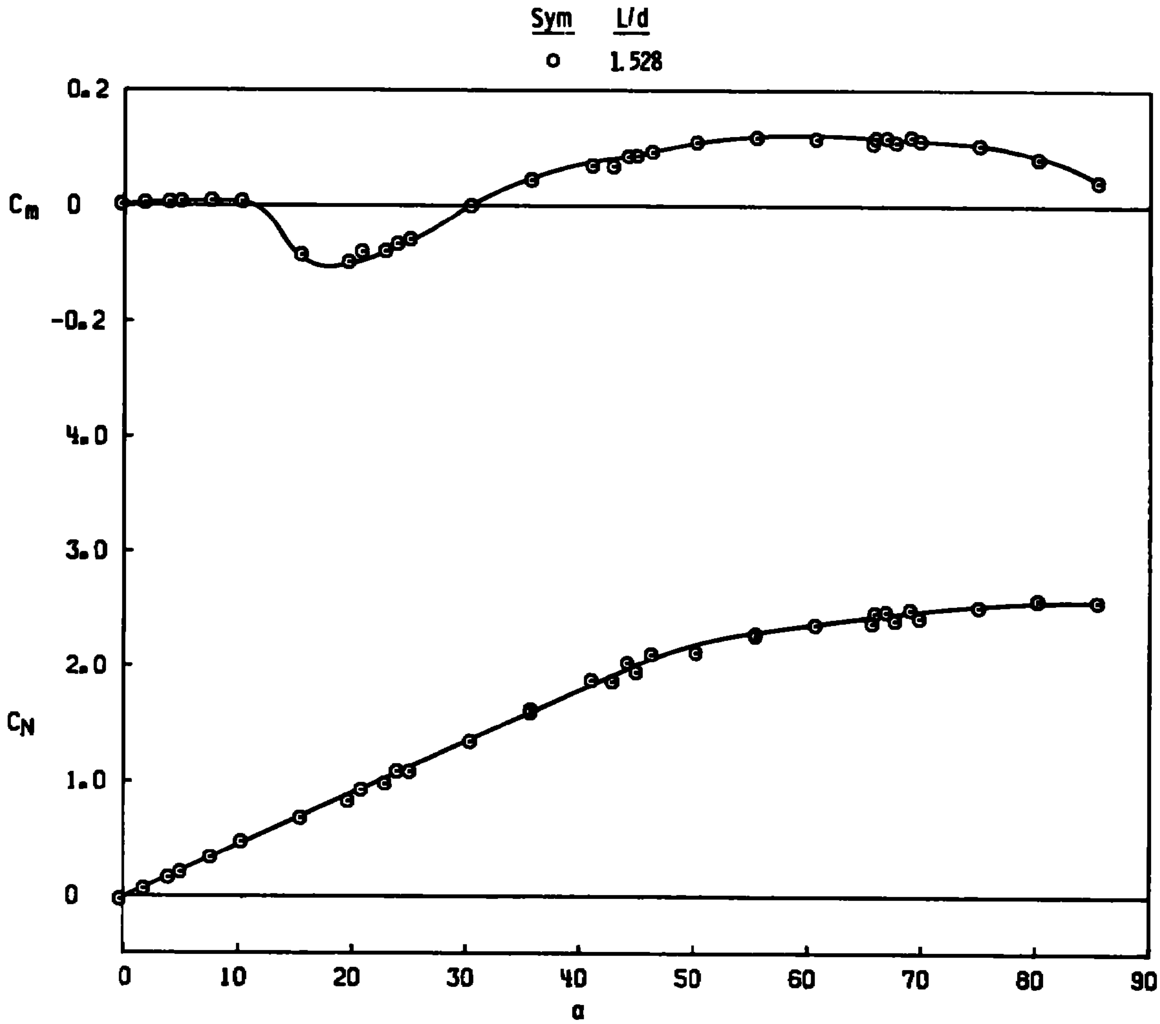


d. C_N and C_m versus α at $Re_d = 1.0 \times 10^6$
Fig. II-4 Continued

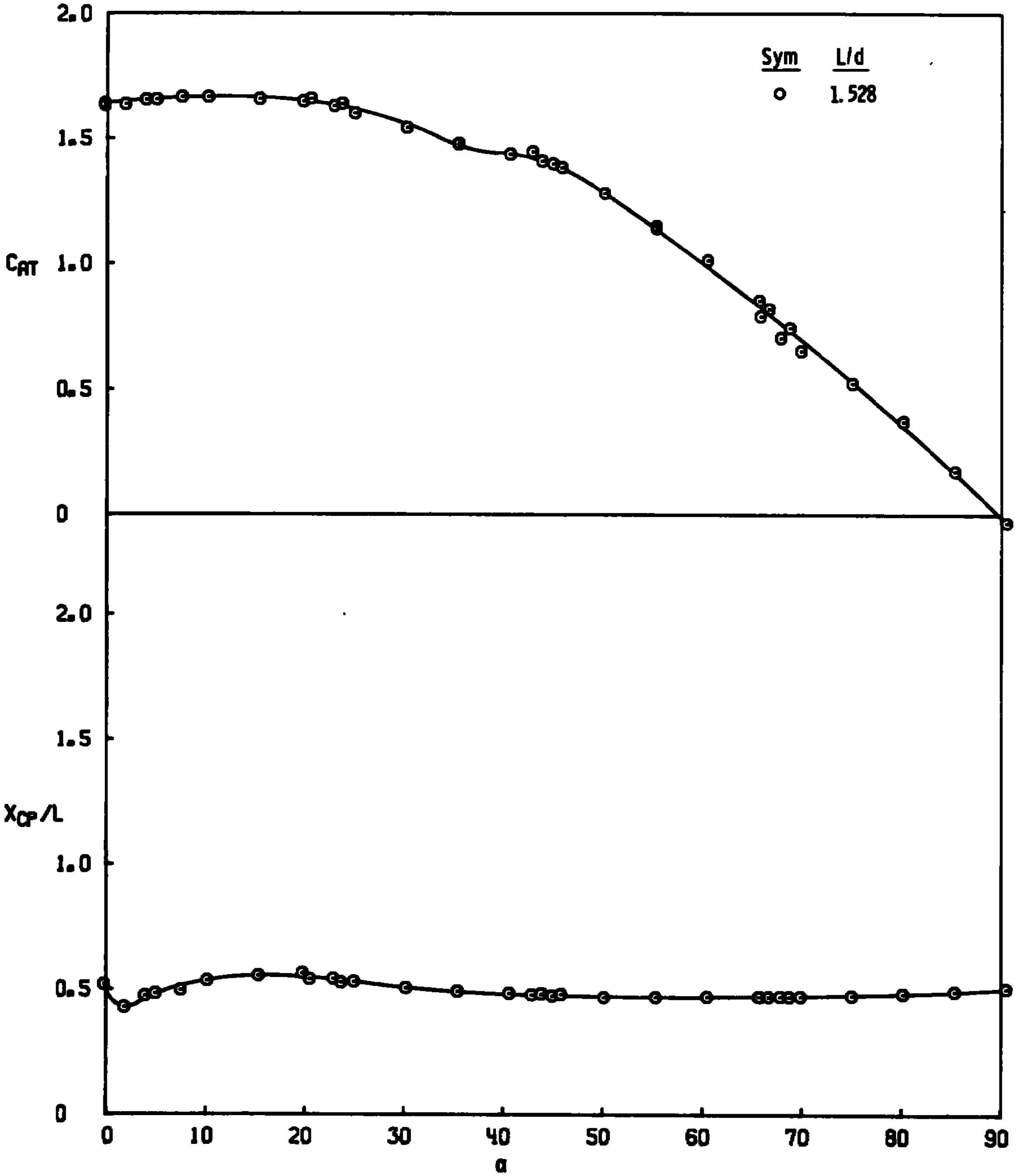


e. C_{AT} and X_{CP}/L versus α at $Re_d = 1.3 \times 10^6$

Fig. II-4 Continued

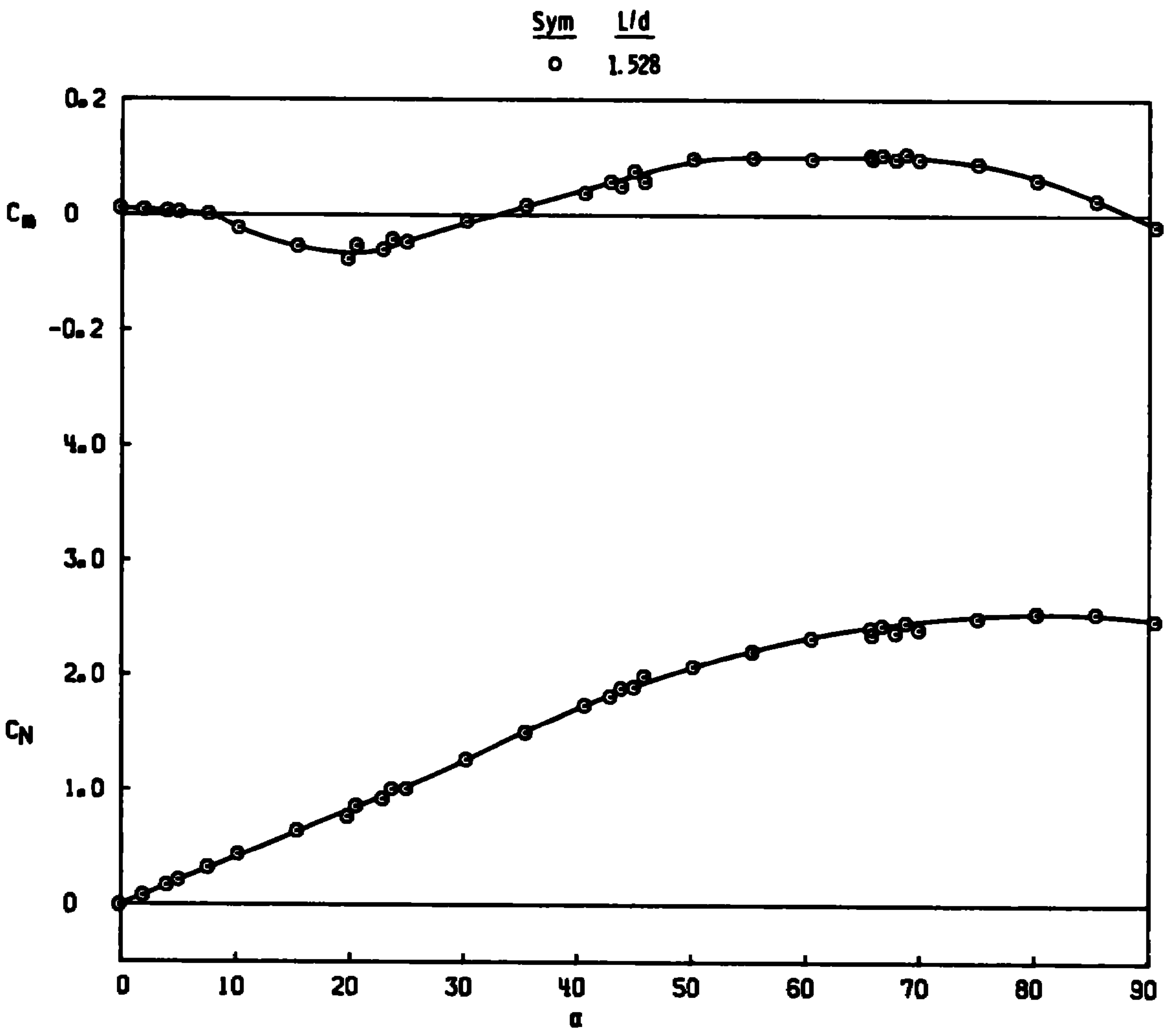


f. C_N and C_m versus α at $Re_d = 1.3 \times 10^6$
Fig. II-4 Concluded

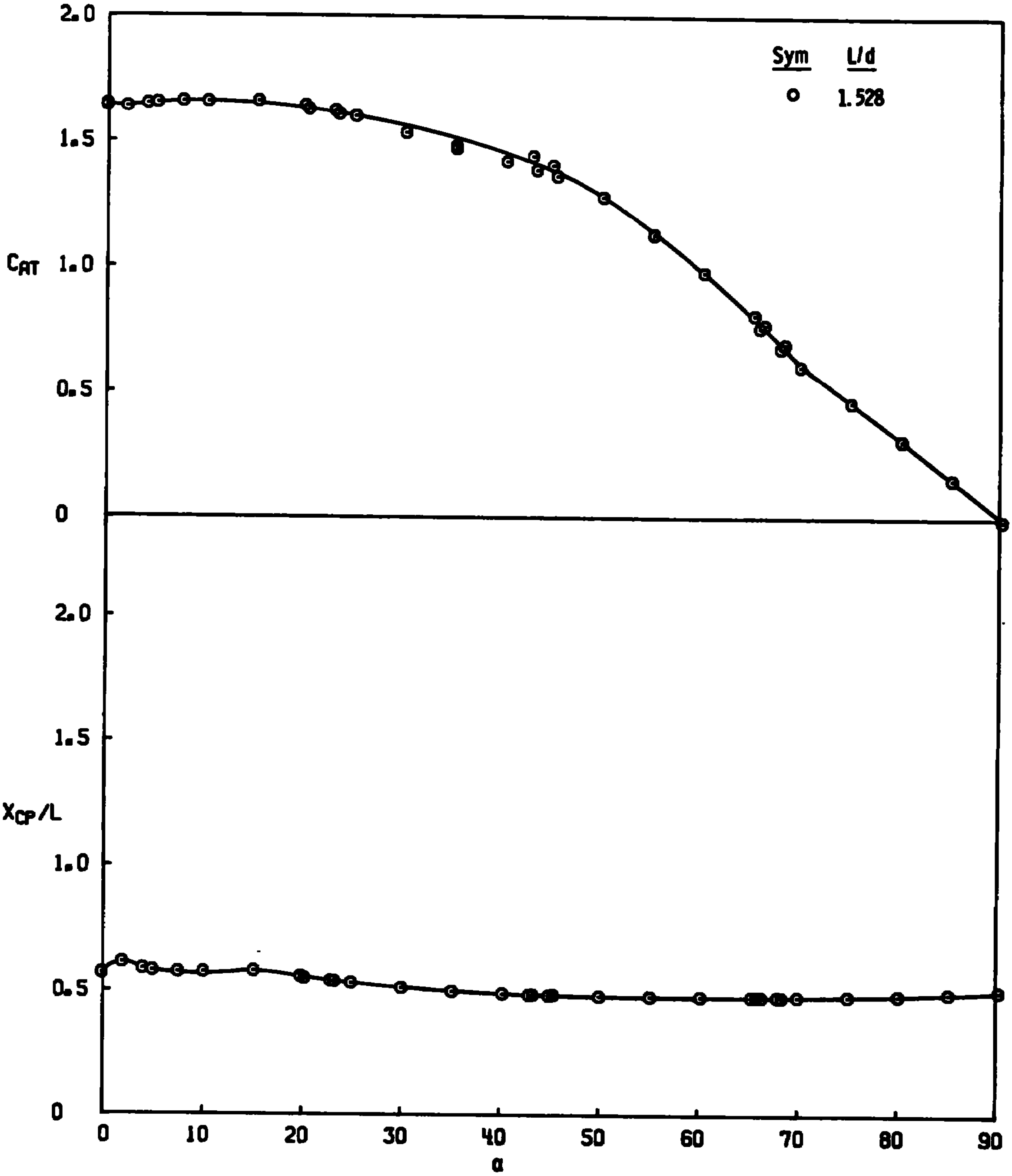


a. C_{AT} and X_{CP}/L versus α

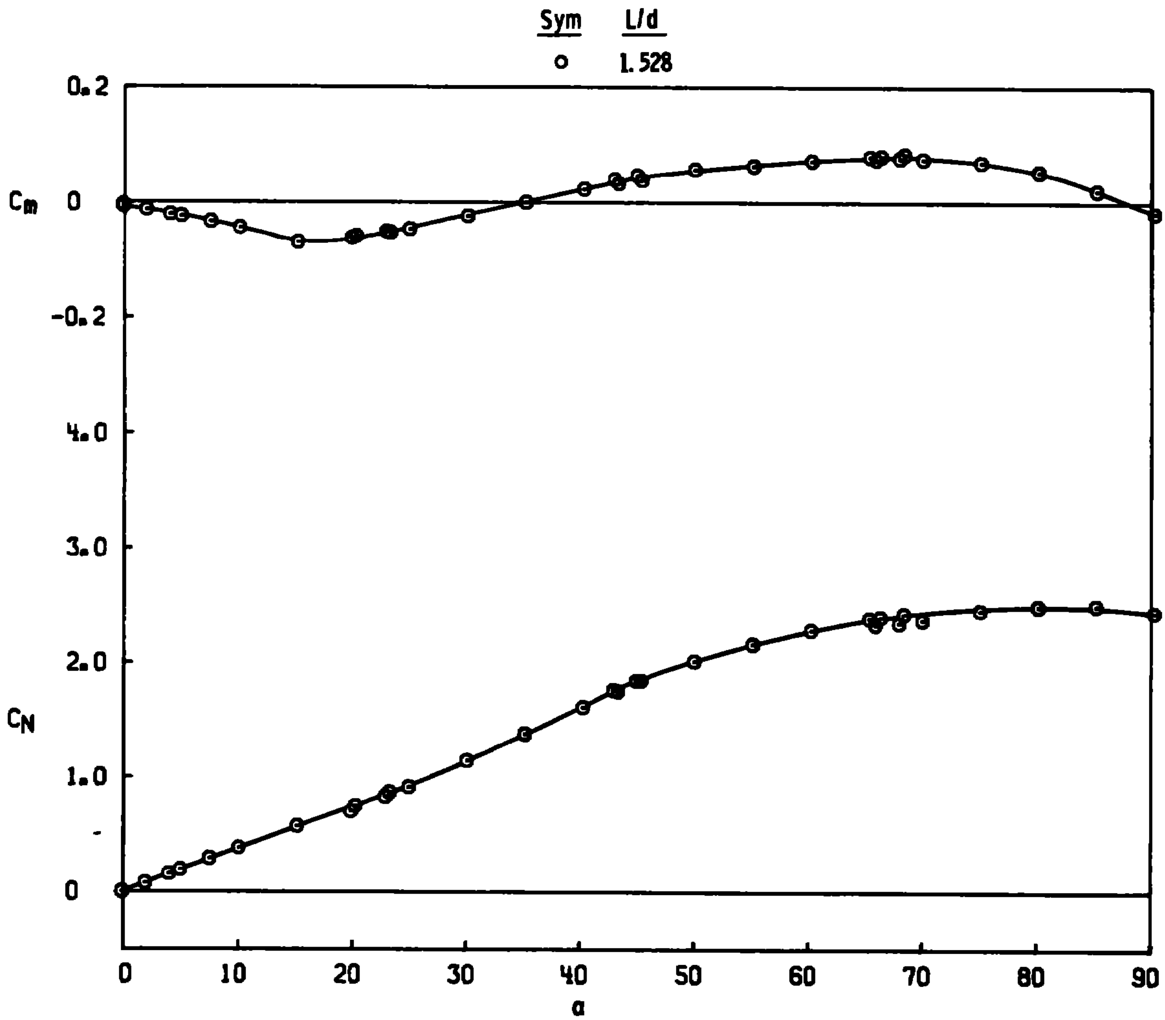
Fig. II-5 Stability Characteristics and Axial Force at M_∞ = 1.75, Re_d = 1.0 x 10^6



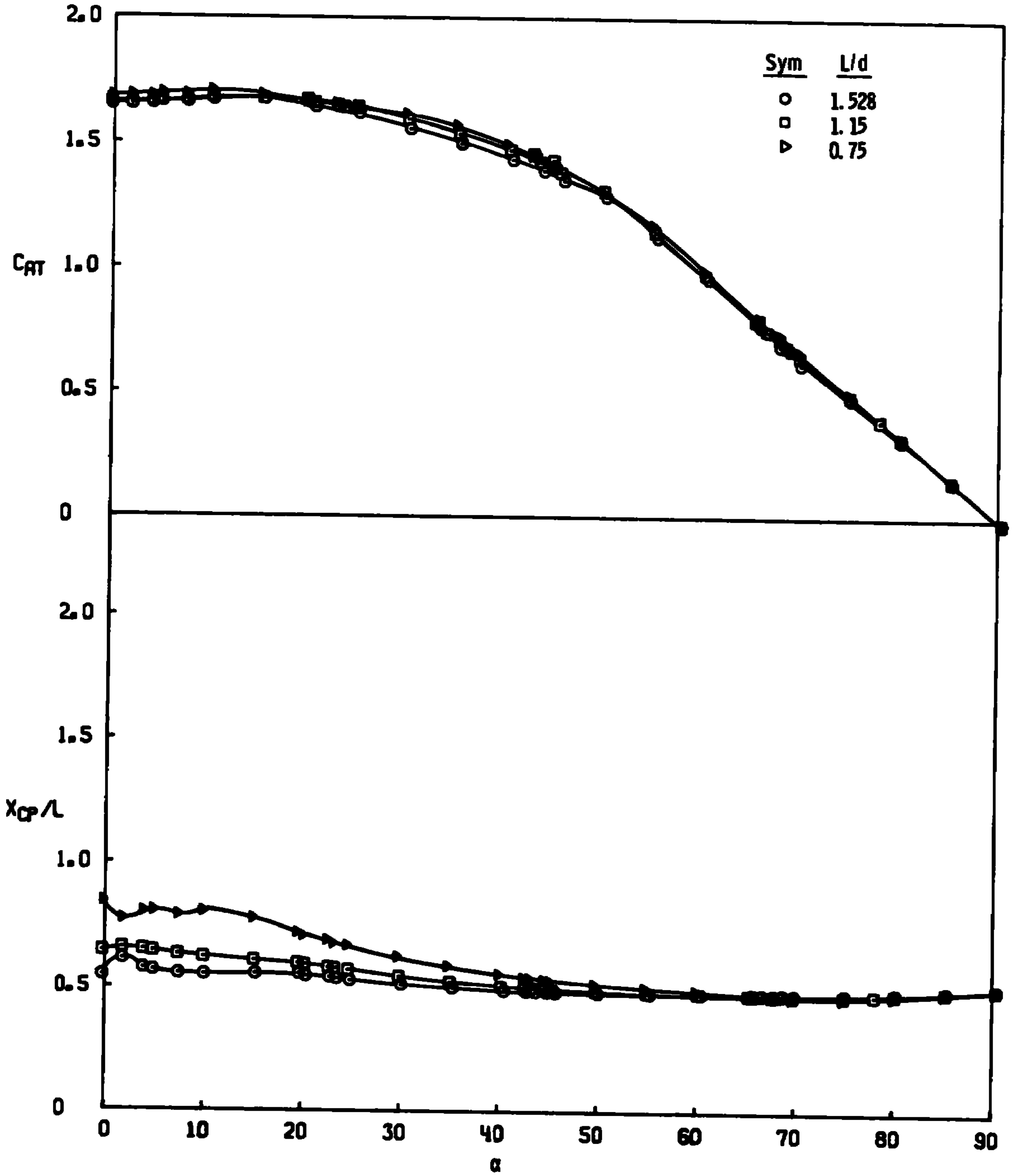
b. C_N and C_m versus α
Fig. II-5 Concluded



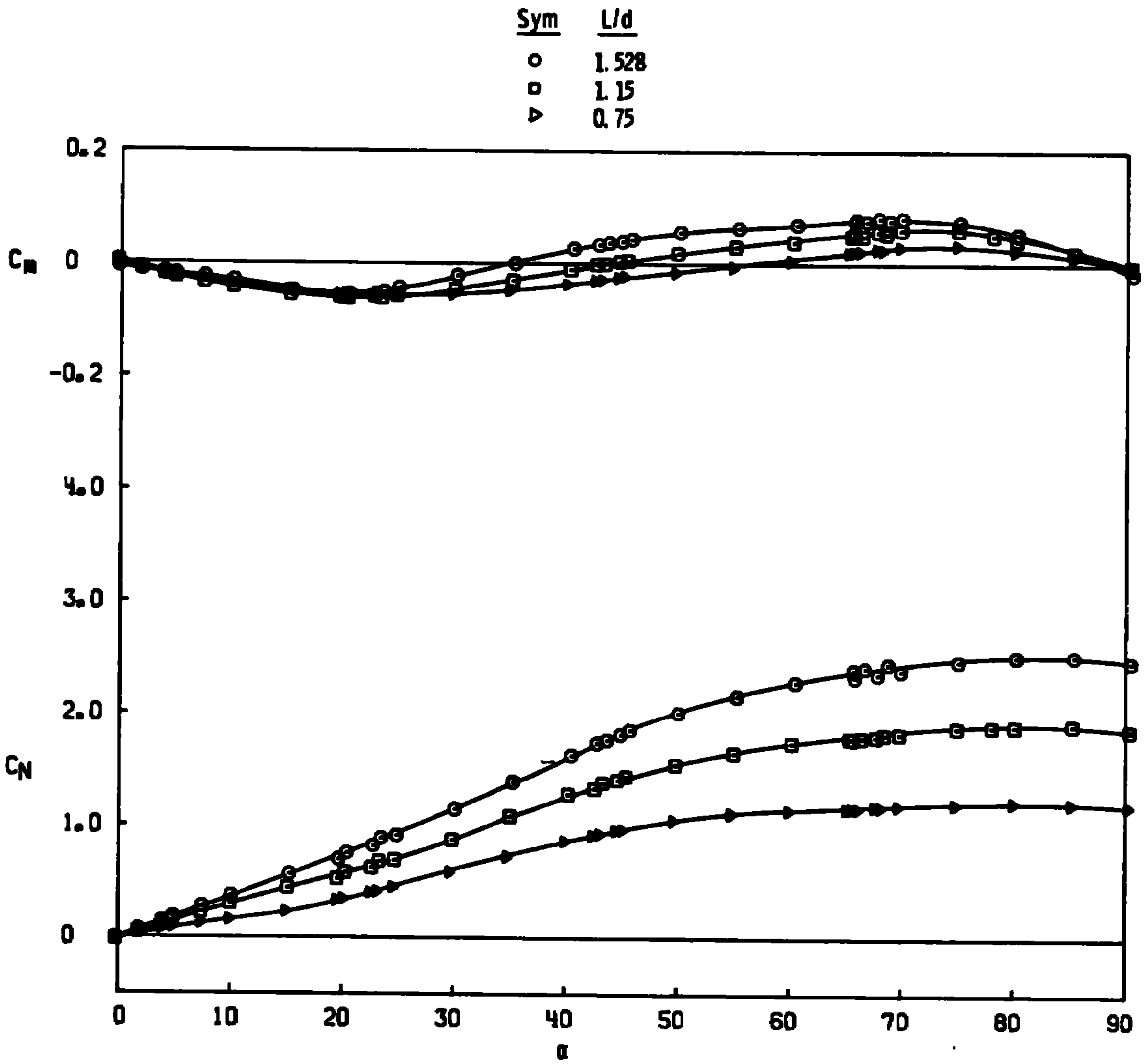
a. C_{AT} and X_{CP}/L versus α at $Re_d = 0.5 \times 10^6$
Fig. II-6 Stability Characteristics and Axial Force at $M_\infty = 2.0$



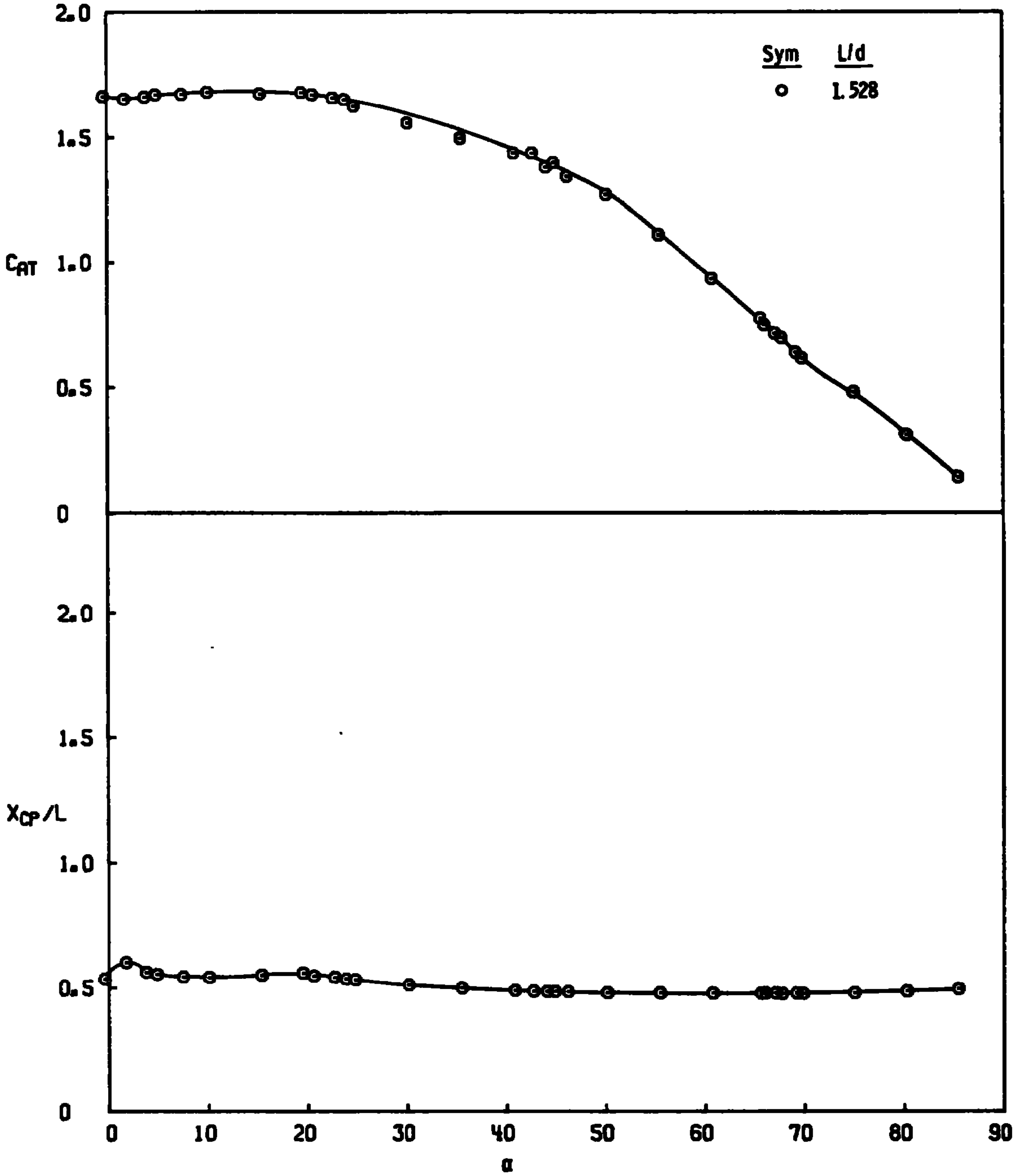
b. C_N and C_m versus α at $Re_d = 0.5 \times 10^6$
Fig. II-6 Continued



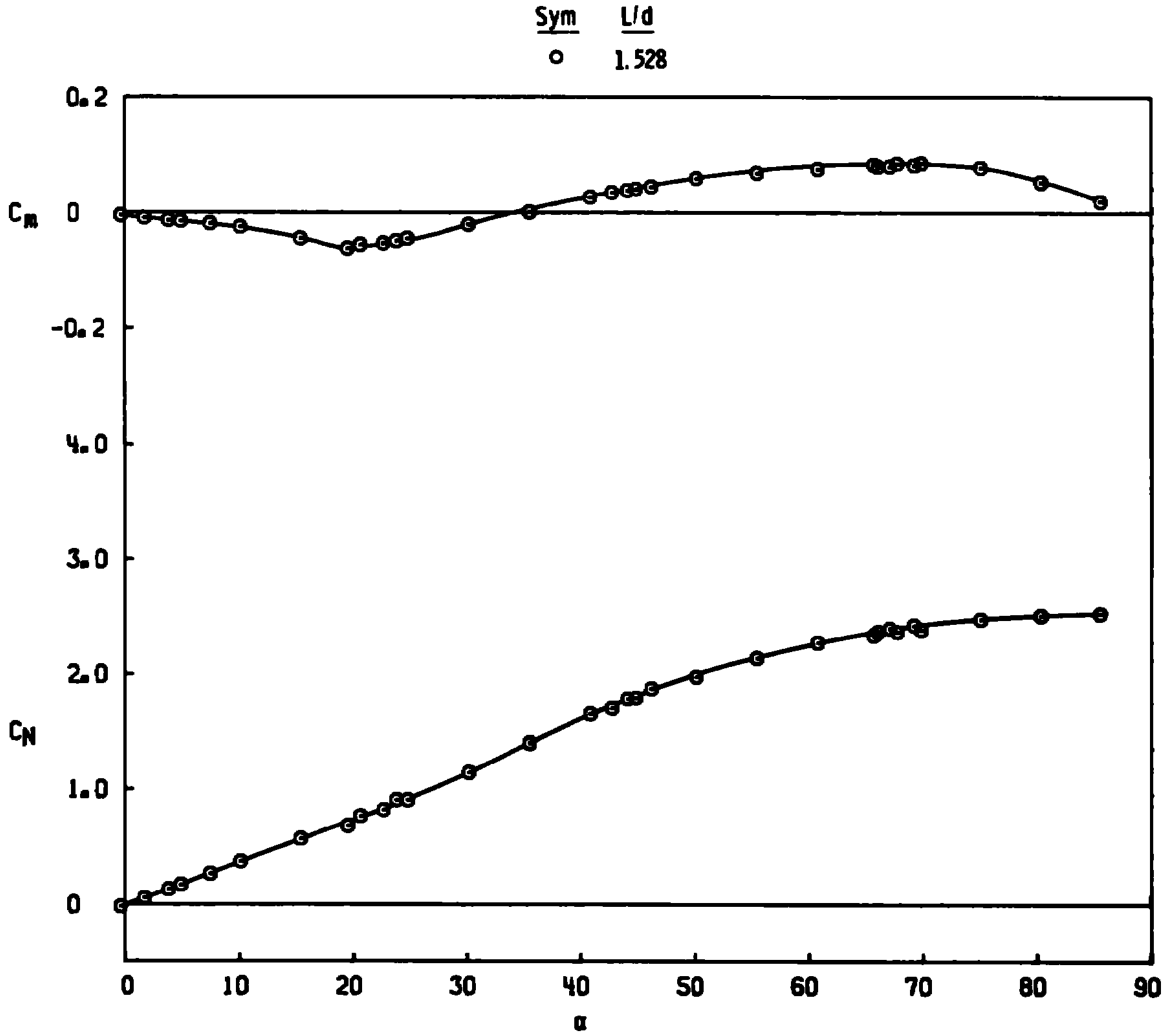
c. C_{AT} and X_{CP}/L versus α at $Re_d = 1.0 \times 10^6$
Fig. II-6 Continued



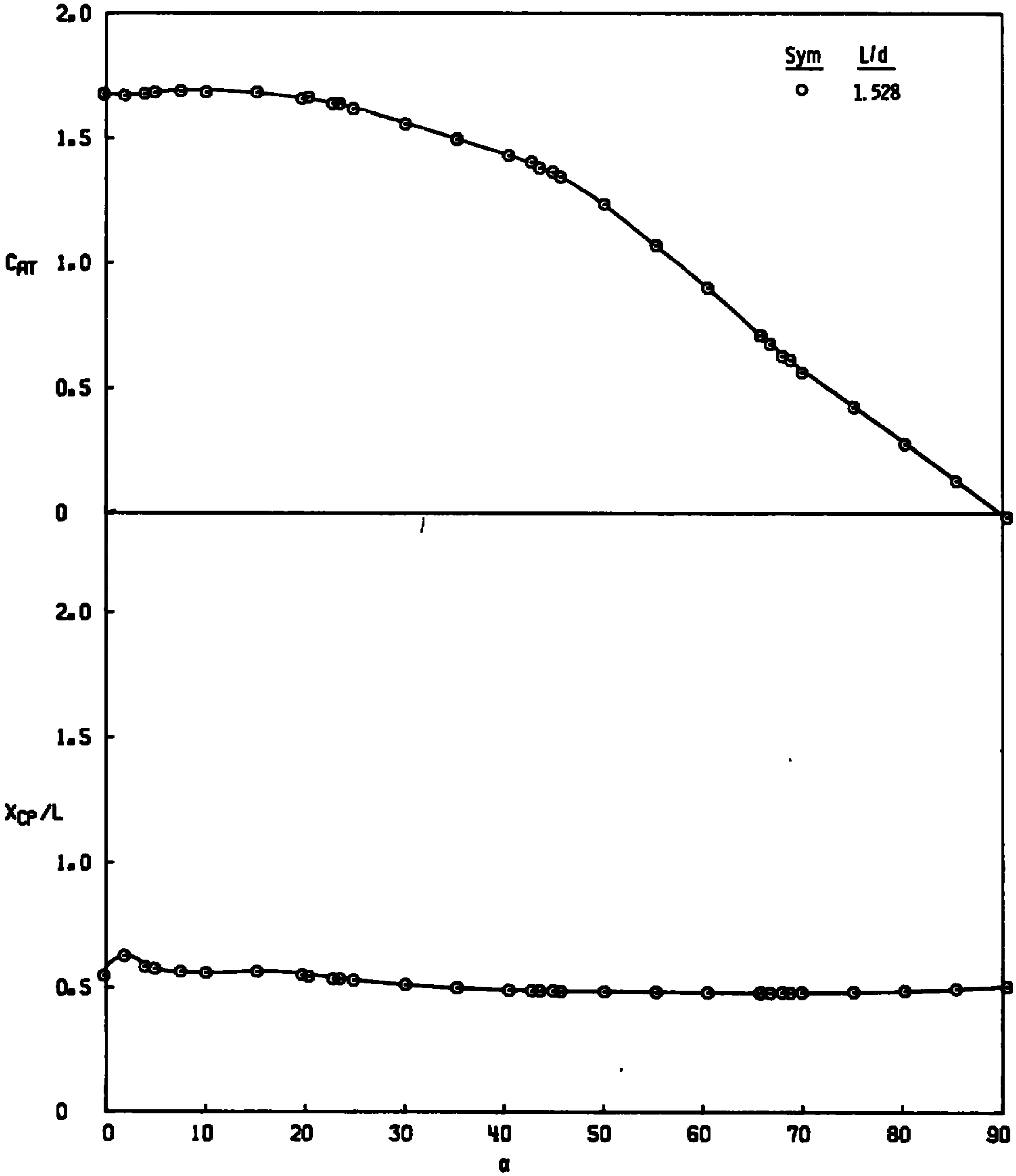
d. C_N and C_m versus α at $Re_d = 1.0 \times 10^6$
Fig. II-6 Continued



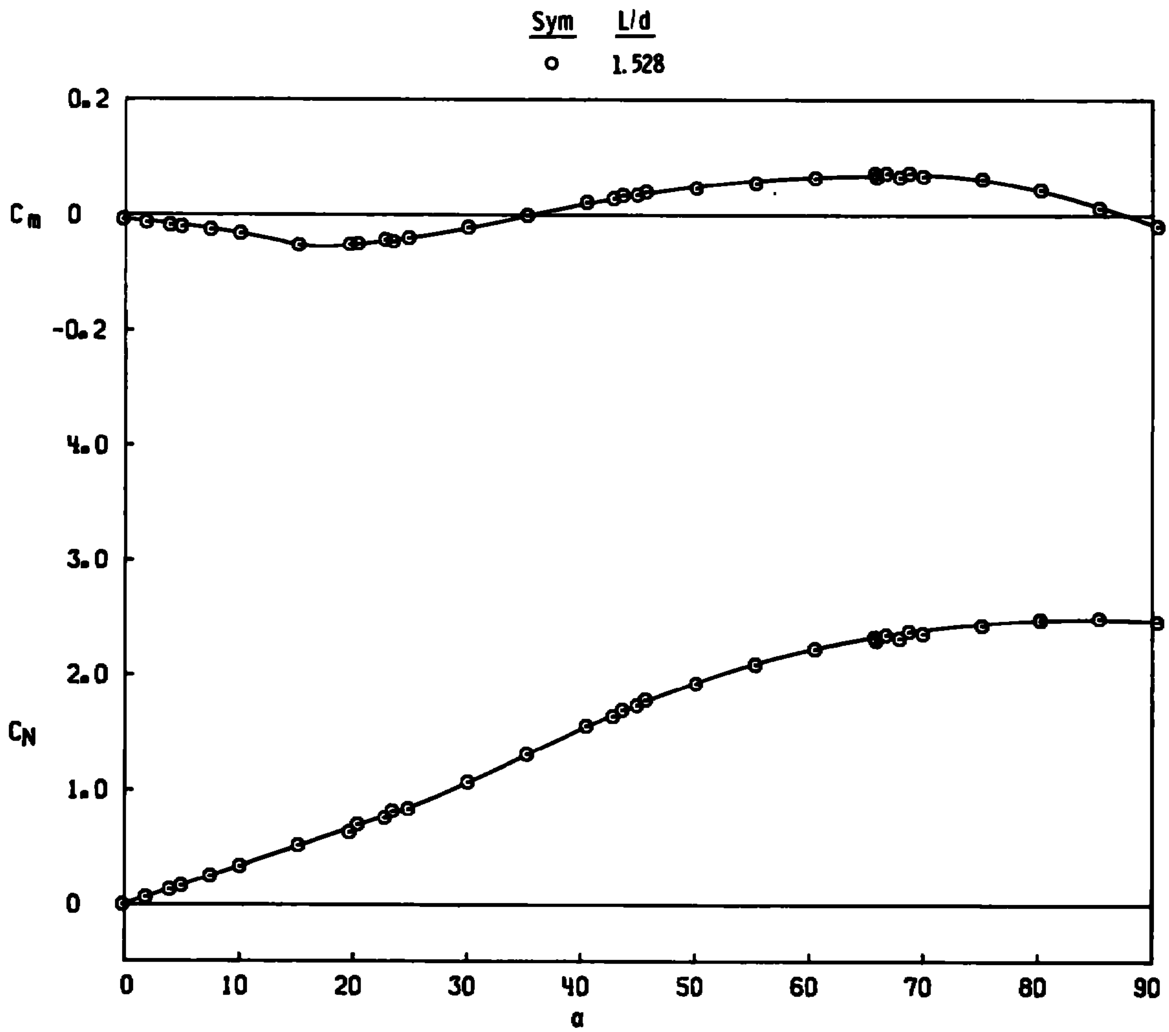
e. C_{AT} and X_{CP}/L versus α at $Re_d = 1.5 \times 10^6$
Fig. II-6 Continued



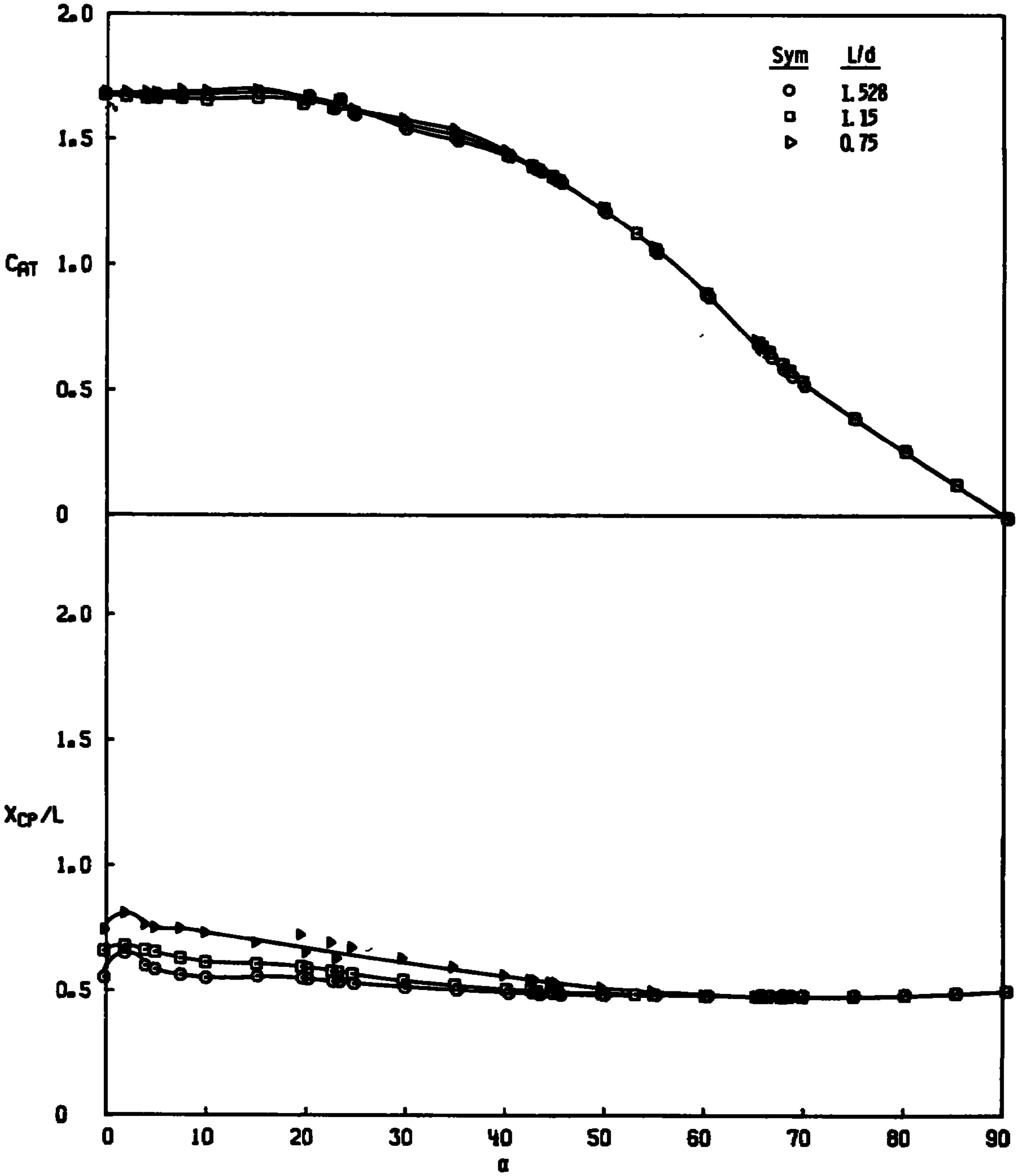
f. C_N and C_m versus α at $Re_d = 1.5 \times 10^6$
Fig. II-6 Concluded



a. C_{AT} and X_{CP}/L versus α
Fig. II-7 Stability Characteristics and Axial Force at M_∞ = 2.25, Re_d = 1.0 x 10^6

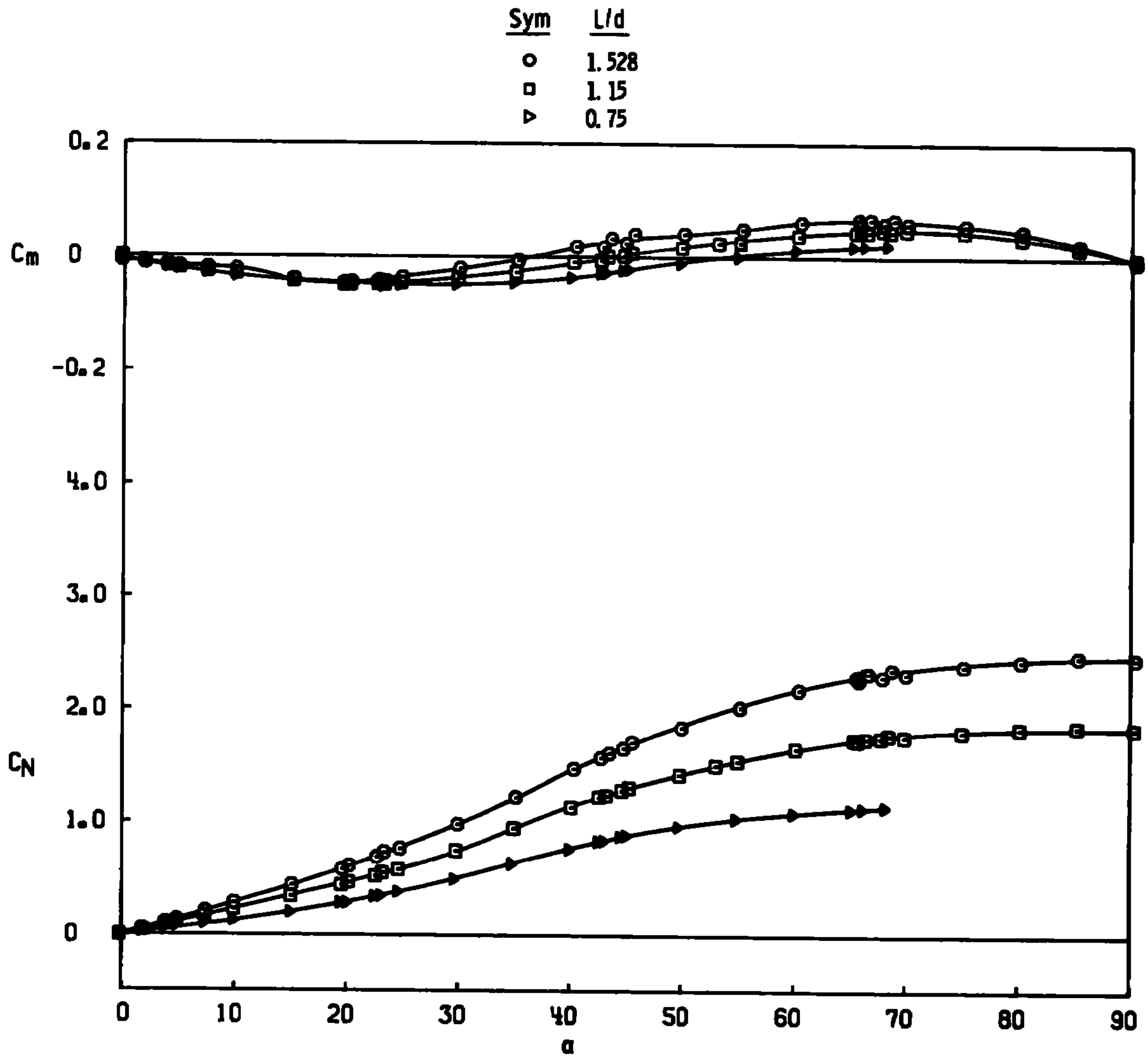


b. C_N and C_m versus α
Fig. II-7 Concluded



a. C_{AT} and X_{CP}/L versus α

Fig. II-8 Stability Characteristics and Axial Force at $M_\infty = 2.5$, $Re_d = 1.0 \times 10^6$



b. C_N and C_m versus α
Fig. II-8 Concluded

APPENDIX III
TABULATED DATA

COMPUTER NOMENCLATURE

ALPHA-M		Angle of attack
CN	C_N	Normal-force coefficient
CM	C_m	Pitching-moment coefficient
CAT	C_{AT}	Total axial-force coefficient
X-CP/L	X_{cp}/L	Center-of-pressure location in percent length
X-CP/D	X_{cp}/d	Center-of-pressure location in calipers
CL	C_L	Lift coefficient
CD	C_D	Drag coefficient (based on C_{AT})
CPB	C_{p_b}	Balance cavity pressure coefficient

$M_\infty = 0.41$ $Re_d = 0.48 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.03	.0171	.0280	.9105	-.5733	-.8760	.0493	.9093	-.1043
-.04	-.0014	-.0255	.9247	6.9701	10.6503	-.0007	.9247	-.1187
1.96	-.0078	-.0854	.9060	-6.6335	-10.1360	-.0389	.9052	-.1343
3.96	.0385	-.1423	.8681	2.9224	4.4654	-.0215	.8687	-.1091
4.96	.0798	-.1731	.8988	1.9190	2.9322	.0018	.9023	-.1212
10.00	.2613	-.1951	.9566	.9886	1.5105	.0913	.9874	-.1693
15.04	.4147	-.1487	.9811	.7347	1.1227	.1459	1.0551	-.2457
20.06	.5892	-.1004	1.0058	.6115	.9343	.2086	1.1469	-.3117
23.08	.6781	-.0881	1.0359	.5851	.8940	.2179	1.2188	-.3464
19.98	.6299	-.1055	1.1287	.6096	.9315	.2063	1.2760	-.3854
22.99	.7229	-.0872	1.1548	.5790	.8847	.2145	1.3455	-.4469
25.01	.7619	-.0656	1.1264	.5563	.8501	.2143	1.3429	-.4647
30.05	.9174	-.0099	1.1190	.5070	.7747	.2338	1.4279	-.4398
35.02	.9518	.0276	1.1213	.4810	.7350	.1359	1.4645	-.4797
40.03	1.0152	.0520	1.0305	.4665	.7128	.1145	1.4420	-.5092
43.07	1.0921	.0622	1.0089	.4628	.7071	.1089	1.4828	-.5337
45.08	1.1365	.0697	.9820	.4598	.7026	.1072	1.4981	-.5132
35.03	.9662	.0388	1.1161	.4737	.7238	.1506	1.4685	-.4845
42.96	1.0862	.0191	.9077	.4885	.7464	.1763	1.4045	-.5052
44.99	1.1326	.0291	.8985	.4832	.7383	.1658	1.4362	-.5172
50.00	1.1983	.0627	.8441	.4658	.7117	.1237	1.4605	-.4524
55.03	1.2074	.0846	.7342	.4541	.6939	.0904	1.4102	-.3039
60.05	1.2350	.0928	.6354	.4508	.6889	.0660	1.3873	-.2990
65.07	1.2497	.0874	.4471	.4542	.6941	.1213	1.3217	-.3827
66.07	1.2824	.0975	.4067	.4502	.6879	.1484	1.3371	-.3928
68.10	1.3002	.1207	.2980	.4393	.6712	.2084	1.3175	-.4310
55.01	1.1980	.0831	.7741	.4546	.6947	.0528	1.4254	-.3316
65.98	1.2844	.0702	.3792	.4642	.7094	.1765	1.3276	-.4327
67.99	1.2735	.0865	.2838	.4556	.6961	.2142	1.2870	-.4417
70.02	1.2425	.0946	.1776	.4502	.6878	.2577	1.2284	-.4339
75.04	1.2359	.1224	.0050	.4352	.6650	.3142	1.1954	-.3832
80.06	1.1549	.1168	-.0418	.4338	.6629	.2406	1.1303	-.3474
85.06	1.1958	.0483	-.0685	.4736	.7236	.1713	1.1855	-.3446
90.02	1.1111	-.0690	.0894	.5406	.8261	-.0898	1.1110	-.3105
92.02	1.1662	-.1082	.2210	.5607	.8568	-.2618	1.1577	-.3855
80.05	1.1958	.1196	-.0488	.4345	.6640	.2547	1.1694	-.3643

$M_\infty = 0.40$ $Re_d = 0.44 \times 10^6$ L/d = 1.15

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.02	.0434	-.0228	1.0524	.9559	1.0993	.0804	1.0502	-.2591
-.04	.0300	-.0355	1.0478	-.6295	-.7239	.0307	1.0478	-.2162
1.95	.0202	-.0506	1.0380	2.6783	3.0800	-.0151	1.0381	-.2150
3.94	.0054	-.0713	1.0467	11.9537	13.7468	-.0666	1.0446	-.2600
4.95	-.0089	-.0815	1.0427	-7.5008	-8.6259	-.0988	1.0381	-.2685
7.43	-.0298	-.1279	1.0586	-3.2356	-3.7210	-.1665	1.0459	-.2672
9.97	-.0233	-.1288	1.0455	-4.2983	-4.9431	-.2039	1.0257	-.2686
14.97	.1022	-.1484	1.0549	1.7627	2.0271	-.1738	1.0455	-.3054
20.04	.4257	-.1434	.9714	.7930	.9119	.0670	1.0585	-.2691
23.03	.5147	-.1317	.9566	.7225	.8308	.0995	1.0818	-.2931
19.96	.4375	-.1261	1.0869	.7507	.8633	.0402	1.1709	-.4189
22.95	.5084	-.1154	1.1038	.6974	.8021	.0378	1.2147	-.4690
24.95	.5544	-.1075	1.1054	.6685	.7688	.0364	1.2361	-.4939
29.96	.5928	-.0813	1.0690	.6192	.7121	-.0202	1.2223	-.4442
34.98	.6125	-.0531	1.0854	.5754	.6618	-.1205	1.2405	-.4778
40.00	.7176	-.0335	1.0248	.5406	.6217	-.1089	1.2463	-.5371
43.02	.7816	-.0255	.9658	.5283	.6076	-.0875	1.2393	-.4724
45.05	.8351	-.0211	.9218	.5220	.6003	-.0625	1.2422	-.5241
34.98	.6196	-.0538	1.0567	.5755	.6618	-.0981	1.2210	-.4480
42.98	.9066	-.0162	.9420	.5156	.5929	.0211	1.3073	-.6220
44.99	.9233	-.0092	.9030	.5087	.5850	.0146	1.2914	-.5668
50.00	1.0100	.0121	.8610	.4896	.5630	-.0103	1.3272	-.5896
55.01	1.0207	.0291	.7513	.4752	.5465	-.0303	1.2670	-.4844
59.98	1.0150	.0366	.6476	.4687	.5390	-.0529	1.2029	-.3693
65.03	1.0497	.0406	.5223	.4664	.5363	-.0303	1.1721	-.3911
66.04	1.0842	.0418	.5063	.4665	.5365	-.0223	1.1964	-.4654
68.00	1.0387	.0409	.4271	.4658	.5356	-.0070	1.1231	-.3696
54.96	1.0059	.0199	.7629	.4828	.5552	-.0471	1.2616	-.5137
65.95	1.1186	.0580	.4793	.4549	.5231	.0182	1.2168	-.4705
67.96	1.1056	.0651	.4129	.4488	.5161	.0322	1.1797	-.4107
69.96	1.0993	.0719	.3450	.4431	.5096	.0525	1.1510	-.4064
74.99	.9926	.0854	.1170	.4252	.4890	.1441	.9890	-.4162
80.05	.9495	.0780	.0007	.4285	.4928	.1634	.9353	-.3738
85.04	.9023	.0240	.0574	.4768	.5484	.0208	.9039	-.3539
90.05	.8623	-.0458	.0422	.5462	.6281	-.0429	.8623	-.2881
92.03	.8743	-.0701	-.0172	.5697	.6552	-.0138	.8744	-.3008
80.07	.9301	.0708	-.0002	.4338	.4988	.1607	.9161	-.3121

$M_\infty = 0.39$ $Re_d = 0.44 \times 10^6$ L/d = 0.75

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.04	.0150	.0255	1.1769	-1.7646	-1.3235	.0569	1.1756	-.2748
-.04	.0096	.0157	1.1801	-1.2334	-.9251	.0105	1.1801	-.2861
1.97	.0039	.0062	1.1673	-1.6348	-1.2261	-.0362	1.1667	-.3150
3.96	-.0072	-.0028	1.1918	-.0082	-.0061	-.0896	1.1884	-.3817
4.96	-.0126	-.0091	1.1617	-.4665	-.3499	-.1131	1.1562	-.3202
7.45	-.0217	-.0214	1.1749	-.8202	-.6151	-.1738	1.1622	-.3287
9.94	-.0270	-.0288	1.1674	-.9241	-.6930	-.2281	1.1452	-.3243
14.97	-.0578	-.0424	1.1907	-.4778	-.3584	-.3635	1.1353	-.3363
19.95	.0042	-.0594	1.2234	19.3502	14.5127	-.4135	1.1514	-.4609
23.00	.0811	-.0692	1.2004	1.6389	1.2291	-.3943	1.1367	-.4180
19.87	.0408	-.0604	1.1262	2.4762	1.8571	-.3444	1.0730	-.3412
22.92	.1378	-.0718	1.1010	1.1946	.8960	-.3019	1.0677	-.3762
24.89	.1927	-.0721	1.0828	.9989	.7491	-.2810	1.0633	-.3652
29.93	.2894	-.0662	1.0847	.8052	.6039	-.2904	1.0844	-.4170
34.96	.3403	-.0588	1.1109	.7305	.5479	-.3577	1.1054	-.4472
39.95	.4117	-.0507	1.0526	.6643	.4982	-.3602	1.0713	-.4679
42.96	.4783	-.0453	1.0564	.6262	.4697	-.3698	1.0991	-.5260
44.98	.5199	-.0450	1.0421	.6154	.4615	-.3688	1.1047	-.5518
34.95	.3351	-.0609	1.0988	.7425	.5569	-.3548	1.0926	-.4096
65.96	.7907	-.0405	.4125	.5684	.4263	-.0546	.8901	-.5779
67.93	.7921	-.0323	.3714	.5544	.4158	-.0466	.8736	-.5818
69.93	.7532	-.0225	.3128	.5399	.4049	-.0353	.8148	-.4626
74.96	.7293	.0039	.2038	.4929	.3697	-.0075	.7572	-.4574
80.05	.6642	.0164	.0794	.4670	.3502	.0366	.6679	-.3998
85.04	.5401	.0108	-.0021	.4733	.3550	.0488	.5379	-.2314
90.03	.4822	-.0601	-.0046	.6662	.4997	.0044	.4822	-.2118
92.03	.5138	-.0823	-.0960	.7137	.5352	.0777	.5169	-.2935
80.02	.6659	.0078	.0775	.4844	.3633	.0391	.6693	-.4012

$M_\infty = 0.42 \qquad Re_d = 0.97 \times 10^6 \qquad L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.05	.0148	.0361	.9292	-1.1023	-1.6843	.0480	.9281	-.1204
-.08	-.0019	-.0187	.9141	22.5629	34.4761	-.0006	.9141	-.1289
1.91	-.0179	-.0782	.9551	-2.3650	-3.6137	-.0497	.9540	-.1314
3.92	.0257	-.1416	.8996	4.1021	6.2680	-.0359	.8992	-.1393
4.94	.0715	-.1675	.9014	2.0320	3.1048	-.0063	.9042	-.1260
10.00	.2568	-.2012	.9657	1.0128	1.5475	.0853	.9956	-.1879
15.06	.4202	-.1590	1.0030	.7476	1.1423	.1451	1.0778	-.2490
20.14	.5935	-.1098	1.0349	.6210	.9490	.2009	1.1760	-.3332
23.18	.6677	-.0898	1.0362	.5881	.8985	.2060	1.2154	-.3637
19.93	.6010	-.1086	1.0905	.6183	.9447	.1932	1.2301	-.4130
22.98	.6797	-.0955	1.1017	.5920	.9045	.1957	1.2796	-.4639
24.98	.7542	-.0769	1.1081	.5668	.8660	.2157	1.3229	-.4751
30.06	.9450	-.0156	1.0821	.5108	.7805	.2758	1.4099	-.4820
35.09	.9204	.0016	1.0596	.4988	.7622	.1439	1.3962	-.5007
40.12	.9909	.0212	.9943	.4860	.7426	.1170	1.3988	-.5166
43.15	1.0441	.0331	.9381	.4793	.7323	.1200	1.3985	-.5273
45.16	1.0923	.0390	.9159	.4766	.7283	.1209	1.4204	-.5196
35.07	.9022	-.0040	1.0541	.5029	.7684	.1328	1.3811	-.4989
42.95	1.1154	.0365	.9461	.4786	.7313	.1717	1.4525	-.5279
44.96	1.1607	.0510	.9285	.4713	.7201	.1652	1.4772	-.5239
49.99	1.2080	.0747	.8629	.4595	.7021	.1158	1.4800	-.4571
55.05	1.2351	.1011	.7714	.4464	.6822	.0754	1.4542	-.3073
60.08	1.2409	.1042	.6727	.4450	.6800	.0359	1.4111	-.2473
65.12	1.2564	.1044	.5338	.4456	.6809	.0444	1.3644	-.2470
66.14	1.2351	.1027	.5008	.4456	.6809	.0417	1.3321	-.2438
68.15	1.2230	.1043	.4338	.4442	.6787	.0526	1.2967	-.2334
55.03	1.2209	.0963	.7901	.4484	.6851	.0524	1.4533	-.3311
65.93	1.3235	.1013	.4565	.4499	.6874	.1230	1.3946	-.2974
67.94	1.3083	.1039	.3977	.4480	.6846	.1227	1.3619	-.2739
69.97	1.2832	.0983	.3407	.4499	.6874	.1194	1.3223	-.2550
75.02	1.2153	.0782	.2039	.4579	.6997	.1173	1.2267	-.2971
80.06	1.1252	.0498	.1012	.4711	.7198	.0946	1.1258	-.3339
85.10	.9725	.0425	-.0885	.4714	.7203	.1713	.9614	-.2972
90.05	.7788	-.0207	.0008	.5174	.7905	-.0015	.7788	-.2466
92.04	.8310	-.0595	.0205	.5468	.8356	-.0501	.8298	-.2593
80.05	1.1316	.0517	.1033	.4701	.7183	.0938	1.1324	-.3503

$M_\infty = 0.42$ $Re_d = 0.95 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.05	.0265	.0082	1.0289	.2303	.2648	.0632	1.0273	-.2084
-.08	.0118	-.0042	1.0544	-.3778	-.4345	.0132	1.0544	-.2123
1.91	-.0058	-.0229	1.0676	-2.9565	-3.4000	-.0413	1.0668	-.2345
3.91	-.0262	-.0446	1.1467	-.9822	-1.1296	-.1042	1.1423	-.2669
4.92	-.0336	-.0539	1.0437	-.8948	-1.0290	-.1230	1.0370	-.2391
7.39	-.0557	-.0908	1.0631	-.9184	-1.0562	-.1919	1.0471	-.2208
9.89	-.0289	-.1121	1.0744	-2.8721	-3.3030	-.2131	1.0534	-.2333
14.94	.1043	-.1355	1.0959	1.6300	1.8745	-.1817	1.0857	-.2687
20.07	.4107	-.1241	.9886	.7627	.8771	.0466	1.0695	-.2797
23.10	.4970	-.1110	.9906	.6942	.7984	.0684	1.1061	-.3066
9.90	-.0358	-.1084	1.0562	-2.1358	-2.4562	-.2168	1.0343	-.2347
19.88	.4225	-.1085	1.0898	.7232	.8317	.0267	1.1685	-.4356
22.91	.4788	-.0953	1.1046	.6732	.7741	.0110	1.2038	-.4592
24.94	.5193	-.0864	1.0966	.6447	.7414	.0086	1.2133	-.4471
29.95	.5831	-.0616	1.0746	.5918	.6806	-.0311	1.2222	-.4986
34.95	.6299	-.0386	1.0667	.5533	.6363	-.0949	1.2352	-.4652
40.00	.7144	-.0212	1.0006	.5258	.6047	-.0959	1.2257	-.5075
43.06	.7757	-.0111	.9457	.5124	.5893	-.0789	1.2206	-.5087
45.07	.8243	-.0049	.9149	.5052	.5810	-.0656	1.2298	-.4849
34.96	.6120	-.0487	1.0578	.5578	.6414	-.1046	1.2176	-.4862
42.93	.8707	-.0043	.9020	.5043	.5799	.0232	1.2535	-.5614
44.93	.9028	-.0009	.8865	.5009	.5760	.0130	1.2652	-.5715
49.96	.9517	.0175	.8179	.4840	.5566	-.0139	1.2548	-.4896
55.01	.9874	.0340	.7355	.4701	.5406	-.0364	1.2307	-.4374
60.00	1.0082	.0441	.6461	.4620	.5313	-.0554	1.1962	-.3586
65.04	1.0200	.0478	.5224	.4593	.5281	-.0432	1.1452	-.3448
66.07	1.0047	.0479	.4788	.4585	.5273	-.0301	1.1126	-.3412
68.06	1.0223	.0497	.4354	.4577	.5263	-.0219	1.1110	-.3645
54.96	.9788	.0304	.7536	.4730	.5440	-.0550	1.2340	-.4558
65.90	1.0251	.0499	.4461	.4577	.5263	.0114	1.1179	-.3349
67.93	1.0231	.0576	.3972	.4511	.5187	.0164	1.0974	-.3024
69.97	1.0235	.0637	.3459	.4459	.5127	.0257	1.0801	-.2647
74.99	.9839	.0769	.2159	.4320	.4969	.0462	1.0062	-.2252
80.05	.8889	.0572	.0962	.4441	.5107	.0589	.8921	-.2985
85.07	.7680	.0380	-.0441	.4569	.5255	.1098	.7614	-.3043
90.06	.5450	-.0227	.0001	.5361	.6166	-.0007	.5450	-.1592
92.04	.6047	-.0486	.0364	.5699	.6554	-.0580	.6030	-.1797
80.06	.9046	.0583	.0968	.4439	.5105	.0608	.9077	-.3319

$M_\infty = 0.60$ $Re_d = 0.46 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.04	.0134	.0319	1.1429	-1.0514	-1.6066	.0542	1.1417	-.2392
-.05	-.0084	.0026	1.1259	-.6990	-1.0681	-.0073	1.1259	-.2303
1.95	-.0254	-.0266	1.1183	-.1844	-.2818	-.0635	1.1168	-.2395
3.95	-.0415	-.0694	1.1200	-.5952	-.9094	-.1186	1.1145	-.2470
4.94	-.0446	-.1111	1.0762	-1.1296	-1.7261	-.1371	1.0683	-.2140
9.96	.1668	-.1872	1.0545	1.2346	1.8864	-.0182	1.0674	-.2256
15.04	.3923	-.1580	1.0458	.7635	1.1666	.1075	1.1118	-.2736
20.08	.5963	-.1328	1.1251	.6458	.9867	.1737	1.2615	-.3476
23.11	.6523	-.1086	1.1351	.6089	.9305	.1544	1.3001	-.4057
19.95	.5505	-.1126	1.1456	.6338	.9685	.1266	1.2647	-.4465
22.96	.6339	-.0971	1.1800	.6003	.9172	.1233	1.3338	-.4904
24.96	.6650	-.0793	1.1700	.5781	.8833	.1091	1.3414	-.4962
30.02	.8101	-.0237	1.1703	.5192	.7933	.1159	1.4186	-.5091
35.05	.9309	.0108	1.1448	.4924	.7524	.1047	1.4718	-.5115
40.09	1.0227	.0428	1.0508	.4726	.7222	.1058	1.4625	-.5310
43.12	1.0879	.0500	1.0044	.4699	.7180	.1076	1.4767	-.5433
45.10	1.1458	.0591	.9685	.4662	.7124	.1228	1.4952	-.5354
35.04	.9267	.0132	1.1154	.4906	.7497	.1183	1.4454	-.5007
42.95	1.1467	.0368	.9938	.4790	.7319	.1621	1.5087	-.5598
44.97	1.1743	.0501	.9616	.4721	.7214	.1512	1.5102	-.5513
49.99	1.2559	.0829	.8804	.4568	.6980	.1331	1.5280	-.4874
55.06	1.3964	.1148	.6136	.4462	.6818	.2967	1.4961	-.4910
60.13	1.5395	.1410	.4573	.4401	.6724	.3703	1.5627	-.4585
65.18	1.5763	.1289	.3122	.4465	.6822	.3783	1.5618	-.4424
66.20	1.5614	.1262	.2820	.4471	.6832	.3721	1.5424	-.4389
68.19	1.5523	.1245	.2266	.4475	.6838	.3663	1.5254	-.4240
55.07	1.4231	.1222	.6566	.4438	.6781	.2766	1.5426	-.5245
66.00	1.5869	.1337	.3096	.4449	.6798	.3625	1.5756	-.5141
68.01	1.5898	.1314	.2595	.4459	.6813	.3545	1.5713	-.5073
70.04	1.5405	.1278	.2047	.4457	.6811	.3336	1.5178	-.4790
75.06	1.5082	.1304	.0862	.4434	.6775	.3055	1.4795	-.4380
80.10	1.4801	.1204	-.0705	.4468	.6827	.3240	1.4459	-.4115
85.13	1.5014	.0703	-.2042	.4694	.7172	.3310	1.4786	-.4256
90.07	1.4977	-.0302	.0814	.5132	.7842	-.0833	1.4976	-.3959
92.02	1.4745	-.0492	.2421	.5218	.7974	-.2939	1.4651	-.4286
80.10	1.5001	.1209	-.0657	.4472	.6834	.3227	1.4664	-.3873

$M_\infty \doteq 0.64$ $Re_d = 0.48 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.06	.0286	-.0002	1.1824	.5062	.5822	.0711	1.1806	-.3028
-.05	.0245	-.0069	1.1929	-.4739	-.5450	.0256	1.1928	-.3106
1.92	.0156	-.0184	1.1785	1.5301	1.7596	-.0240	1.1784	-.3055
3.93	.0046	-.0300	1.1942	6.1402	7.0612	-.0772	1.1917	-.3225
3.93	.0022	-.0275	1.1920	11.4399	13.1559	-.0795	1.1894	-.3334
4.96	-.0017	-.0354	1.2198	-17.1548	-19.7280	-.1071	1.2151	-.3532
7.43	-.0249	-.0519	1.1757	-1.3128	-1.5097	-.1767	1.1627	-.2954
9.92	-.0470	-.0590	1.2158	-.5925	-.6813	-.2557	1.1896	-.3021
14.95	.0139	-.0770	1.2140	5.3234	6.1220	-.2998	1.1765	-.3491
20.00	.1943	-.1083	1.1996	.9848	1.1325	-.2278	1.1937	-.3621
23.06	.4064	-.1053	1.1304	.7253	.8341	-.0687	1.1992	-.3565
19.91	.3690	-.1009	1.1631	.7378	.8485	-.0491	1.2193	-.4600
22.92	.4530	-.0927	1.1988	.6780	.7797	-.0497	1.2806	-.4893
24.92	.5066	-.0829	1.2052	.6424	.7387	-.0485	1.3065	-.5070
29.98	.5835	-.0548	1.1752	.5817	.6690	-.0818	1.3096	-.5042
34.96	.6435	-.0287	1.1591	.5387	.6195	-.1369	1.3187	-.4935
40.00	.7737	-.0075	1.0890	.5084	.5847	-.1074	1.3315	-.5214
43.04	.8436	.0036	1.0273	.4963	.5707	-.0845	1.3266	-.4965
45.08	.9086	.0102	.9545	.4903	.5638	-.0343	1.3173	-.5035
34.98	.6474	-.0292	1.1591	.5393	.6202	-.1340	1.3209	-.5190
42.93	.9391	.0104	1.0161	.4904	.5639	-.0045	1.3836	-.5962
44.94	.9402	.0191	.9542	.4823	.5547	-.0087	1.3396	-.5737
49.96	1.0058	.0391	.8833	.4662	.5362	-.0292	1.3383	-.5491
55.03	1.0743	.0552	.7909	.4553	.5236	-.0324	1.3336	-.4893
59.99	1.0999	.0583	.6575	.4539	.5220	-.0194	1.2813	-.4694
65.07	1.1512	.0681	.4094	.4486	.5159	.1141	1.2165	-.4931
66.09	1.1777	.0762	.3313	.4437	.5103	.1745	1.2110	-.4546
68.11	1.1656	.0794	.2796	.4408	.5069	.1751	1.1858	-.4283
54.97	1.0621	.0512	.8065	.4581	.5268	-.0507	1.3327	-.4870
65.97	1.2039	.0787	.3604	.4432	.5096	.1612	1.2463	-.5259
67.96	1.1920	.0812	.3020	.4408	.5069	.1674	1.2183	-.5010
69.99	1.1540	.0843	.2389	.4365	.5019	.1703	1.1661	-.4681
74.99	1.0784	.0973	.1207	.4215	.4848	.1627	1.0729	-.3825
80.08	1.0511	.0820	.0017	.4321	.4970	.1794	1.0356	-.3569
85.09	1.0501	.0475	-.1158	.4607	.5298	.2052	1.0363	-.3798
90.05	1.0905	-.0266	.1420	.5212	.5994	-.1428	1.0904	-.3915
92.01	1.1262	-.0409	.2440	.5316	.6113	-.2834	1.1169	-.4657
78.04	1.0862	.0851	.0509	.4319	.4967	.1753	1.0732	-.3929

$M_\infty = 0.60$ $Re_d = 0.46 \times 10^6$ $L/d = 0.75$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.06	.0141	.0289	1.2338	-2.2267	-1.6700	.0584	1.2325	-.3315
-.05	.0051	.0207	1.2440	-1.0020	-.7515	.0062	1.2440	-.3676
1.95	-.0016	.0124	1.2580	11.0537	8.2902	-.0443	1.2572	-.3492
3.92	-.0097	.0024	1.2625	.8284	.6213	-.0960	1.2589	-.3607
4.92	-.0132	-.0006	1.2532	.4403	.3302	-.1207	1.2474	-.3661
7.41	-.0203	-.0121	1.2628	-.2943	-.2207	-.1830	1.2496	-.3887
9.94	-.0294	-.0177	1.2590	-.3023	-.2267	-.2461	1.2351	-.3653
14.94	-.0433	-.0289	1.2724	-.3903	-.2927	-.3699	1.2182	-.3937
19.95	.0032	-.0435	1.2885	18.4953	13.8715	-.4366	1.2123	-.4433
22.95	.0815	-.0569	1.2770	1.4308	1.0731	-.4229	1.2077	-.4845
20.83	.0415	-.0459	1.1887	1.9745	1.4809	-.3840	1.1258	-.3867
22.85	.1017	-.0545	1.2107	1.2151	.9113	-.3765	1.1551	-.3973
24.87	.1534	-.0552	1.1631	.9794	.7346	-.3499	1.1198	-.3686
29.88	.2721	-.0497	1.2151	.7436	.5577	-.3694	1.1891	-.4604
34.91	.3545	-.0412	1.1911	.6550	.4913	-.3909	1.1796	-.5062
39.95	.4558	-.0351	1.1668	.6026	.4519	-.3997	1.1872	-.5321
42.98	.4919	-.0277	1.1116	.5752	.4314	-.3980	1.1486	-.5554
44.98	.5260	-.0256	1.0906	.5650	.4237	-.3989	1.1433	-.5566
34.92	.3519	-.0422	1.1923	.6599	.4949	-.3940	1.1790	-.4972
65.91	.8296	-.0009	.4412	.5014	.3760	-.0642	.9374	-.5866
67.90	.8037	.0066	.3806	.4890	.3667	-.0503	.8878	-.5429
69.92	.8041	.0157	.3266	.4740	.3555	-.0307	.8673	6.8807
74.98	.7692	.0356	.1854	.4382	.3287	.0203	.7910	-.5039
80.06	.6977	.0496	.0268	.4053	.3040	.0940	.6919	-.4011
85.04	.6468	.0239	-.0011	.4508	.3381	.0570	.6442	-.3219
90.03	.6590	-.0257	.0101	.5520	.4140	-.0104	.6590	-.3522
92.03	.6723	-.0575	.1488	.6140	.4605	-.1726	.6666	-.3667
80.07	.6844	.0442	.0240	.4139	.3104	.0944	.6783	-.3931

$M_\infty = 0.60$ $Re_d = 0.92 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.07	.0152	.0374	1.1213	-1.1072	-1.6918	.0558	1.1200	-.2481
-.09	-.0091	.0083	1.1369	-.4941	-.7550	-.0073	1.1369	-.2382
1.88	-.0325	-.0226	1.1425	.0452	.0691	-.0700	1.1409	-.2393
3.86	-.0524	-.0669	1.1213	-.3352	-.5122	-.1278	1.1152	-.2465
4.86	-.0588	-.1027	1.0947	-.6421	-.9812	-.1514	1.0858	-.2247
9.93	.1509	-.1875	1.0556	1.3134	2.0069	-.0334	1.0658	-.2249
15.05	.3947	-.1637	1.0506	.7715	1.1789	.1082	1.1171	-.2783
20.14	.5948	-.1344	1.1264	.6479	.9900	.1705	1.2623	-.3475
23.18	.6495	-.1117	1.1453	.6125	.9359	.1464	1.3085	-.4120
19.90	.5497	-.1201	1.1632	.6430	.9825	.1208	1.2809	-.4366
22.94	.6367	-.1018	1.1895	.6047	.9239	.1228	1.3436	-.4992
24.95	.6947	-.0837	1.2011	.5788	.8845	.1232	1.3821	-.4948
30.02	.8469	-.0273	1.1659	.5211	.7963	.1500	1.4332	-.5328
35.08	.9397	.0140	1.1025	.4903	.7491	.1353	1.4423	-.5268
40.15	1.0454	.0412	1.0514	.4742	.7246	.1211	1.4777	-.5408
43.21	1.1074	.0556	.9960	.4671	.7138	.1253	1.4841	-.5433
45.24	1.1629	.0670	.9621	.4623	.7064	.1357	1.5032	-.5440
35.09	.9369	.0137	1.1059	.4905	.7494	.1308	1.4435	-.5206
42.93	1.1608	.0599	1.0106	.4663	.7124	.1618	1.5306	-.5569
44.93	1.1794	.0724	.9737	.4598	.7026	.1473	1.5223	-.5373
50.00	1.2516	.1017	.9057	.4468	.6827	.1108	1.5409	-.4941
50.00	1.2536	.1035	.9074	.4459	.6814	.1108	1.5436	-.4831
55.06	1.3141	.1363	.7973	.4321	.6602	.0991	1.5338	-.3541
60.15	1.3706	.1320	.6531	.4370	.6677	.1156	1.5139	-.3951
65.27	1.4541	.1323	.4398	.4404	.6730	.2090	1.5047	-.4810
66.30	1.4450	.1413	.3912	.4360	.6662	.2227	1.4803	-.4782
68.35	1.5214	.1749	.2878	.4247	.6490	.2937	1.5203	-.4395
55.06	1.2932	.1338	.8094	.4323	.6605	.0772	1.5237	-.3523
65.96	1.5225	.1292	.4282	.4445	.6791	.2291	1.5649	-.5102
68.01	1.5444	.1259	.3424	.4467	.6825	.2610	1.5603	-.5321
70.04	1.5184	.1255	.2696	.4459	.6813	.2650	1.5192	-.5281
75.15	1.5175	.1977	.0425	.4147	.6337	.3477	1.4777	-.3917
80.20	1.4410	.1775	-.0417	.4194	.6408	.2865	1.4129	-.3303
85.21	1.3465	.1064	-.1216	.4483	.6850	.2337	1.3316	-.3285
90.00	1.3044	-.0589	.2308	.5295	.8091	-.2308	1.3044	-.2917
91.91	1.3555	-.1095	.3827	.5529	.8448	-.4277	1.3420	-.2735
80.19	1.4261	.1795	-.0346	.4176	.6381	.2770	1.3994	-.3410

$M_\infty = 0.59$ $Re_d = 0.92 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.11	.0210	.0210	1.2217	-.3710	-.4267	.0660	1.2201	-.3028
-.13	.0128	.0100	1.2144	-.4670	-.5370	.0156	1.2144	-.2939
1.87	.0036	.0012	1.2016	.2070	.2380	-.0355	1.2011	-.3129
3.90	-.0091	-.0129	1.2028	-.7359	-.8463	-.0907	1.1994	-.3352
4.86	-.0127	-.0193	1.2101	-.8187	-.9415	-.1152	1.2047	-.3336
7.36	-.0398	-.0389	1.2214	-.3502	-.4028	-.1960	1.2062	-.3225
9.86	-.0551	-.0524	1.1964	-.3273	-.3764	-.2591	1.1693	-.3075
14.87	.0047	-.0707	1.2459	13.4909	15.5146	-.3152	1.2053	-.3731
19.98	.1944	-.1014	1.2099	.9537	1.0968	-.2308	1.2034	-.3789
23.10	.4034	-.0977	1.1363	.7106	.8172	-.0747	1.2035	-.3717
19.81	.3554	-.1003	1.1820	.7455	.8573	-.0663	1.2325	-.4456
22.84	.4472	-.0905	1.1931	.6759	.7773	-.0511	1.2732	-.4742
24.86	.4957	-.0801	1.1927	.6406	.7367	-.0516	1.2906	-.5024
29.88	.5811	-.0543	1.1752	.5813	.6685	-.0817	1.3084	-.5021
34.96	.6508	-.0294	1.1564	.5393	.6202	-.1293	1.3207	-.5023
40.03	.7796	-.0064	1.0459	.5071	.5831	-.0758	1.3022	-.4965
43.11	.8674	.0089	.9714	.4911	.5647	-.0306	1.3019	-.4846
45.11	.8978	.0132	.9410	.4872	.5603	-.0332	1.3002	-.4757
34.95	.6451	-.0295	1.1457	.5397	.6207	-.1277	1.3086	-.5037
42.87	.9159	.0079	.9753	.4925	.5664	.0078	1.3379	-.5716
44.91	.9434	.0107	.9540	.4902	.5637	-.0053	1.3417	-.5742
49.94	.9997	.0332	.8771	.4712	.5418	-.0279	1.3296	-.5207
55.00	1.0594	.0515	.7814	.4578	.5264	-.0326	1.3161	-.4501
60.02	1.0793	.0571	.6665	.4540	.5221	-.0380	1.2680	-.4240
65.09	1.0973	.0594	.5056	.4529	.5208	.0036	1.2082	-.4637
66.13	1.0999	.0602	.4718	.4524	.5202	.0138	1.1968	-.4769
68.13	1.1000	.0635	.3821	.4498	.5173	.0551	1.1632	-.4744
54.96	1.0311	.0488	.7837	.4588	.5277	-.0495	1.2942	-.4569
65.90	1.1664	.0733	.4685	.4454	.5122	.0487	1.2560	-.4910
67.91	1.1522	.0777	.3928	.4414	.5076	.0692	1.2154	-.4599
69.97	1.1419	.0828	.3192	.4370	.5025	.0912	1.1822	-.4686
75.03	1.0894	.0872	.1570	.4304	.4950	.1298	1.0930	-.4627
80.17	.9968	.1029	-.0849	.4103	.4718	.2538	.9677	-.3678
85.25	.8886	.0730	-.2378	.4286	.4928	.3106	.8658	-.3036
89.95	.8763	-.0504	.2447	.5500	.6325	-.2440	.8765	-.2248
91.91	.9109	-.0597	.3547	.5570	.6406	-.3848	.8985	-.2896
80.17	.9887	.1019	-.0901	.4103	.4719	.2576	.9587	-.3712

$M_{\infty} = 0.78$ $Re_d = 0.46 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.08	.0139	.0200	1.2784	-.4418	-.6751	.0604	1.2771	-.3100
-.09	.0047	.0019	1.2817	-.5460	-.8343	.0066	1.2817	-.3153
1.91	-.0072	-.0131	1.2875	-.6920	-1.0574	-.0501	1.2866	-.3383
3.92	-.0202	-.0359	1.2837	-.6608	-1.0098	-.1080	1.2793	-.3459
4.92	-.0317	-.0463	1.2887	-.4559	-.6966	-.1421	1.2812	-.3410
7.40	-.0431	-.0829	1.2612	-.7587	-1.1592	-.2052	1.2451	-.2971
9.93	-.0143	-.0905	1.2440	-3.6293	-5.5456	-.2287	1.2229	-.2962
15.00	.2573	-.1415	1.2030	.8600	1.3141	-.0629	1.2286	-.3172
20.11	.5444	-.1376	1.1991	.6654	1.0168	.0989	1.3132	-.3682
23.13	.6327	-.1099	1.2553	.6137	.9377	.0888	1.4029	-.4251
19.92	.5514	-.1326	1.3052	.6574	1.0045	.0738	1.4150	-.5168
22.92	.6468	-.1002	1.3156	.6014	.9190	.0833	1.4636	-.5331
24.95	.6972	-.0763	1.2803	.5716	.8735	.0922	1.4549	-.5347
29.99	.8499	-.0237	1.2650	.5182	.7919	.1037	1.5204	-.5400
35.05	.9812	.0237	1.2324	.4842	.7399	.0956	1.5724	-.5498
40.11	1.1506	.0712	1.1394	.4595	.7021	.1459	1.6127	-.5532
43.16	1.2762	.0782	1.0884	.4599	.7027	.1864	1.6669	-.5415
45.21	1.3964	.0898	1.0422	.4579	.6997	.2442	1.7253	-.5355
35.04	.9742	.0249	1.2329	.4833	.7384	.0897	1.5688	-.5388
42.99	1.3959	.0953	1.0780	.4553	.6958	.2861	1.7403	-.5821
44.98	1.4235	.1132	1.0011	.4479	.6845	.2991	1.7143	-.5546
50.07	1.5506	.1375	.8560	.4420	.6753	.3390	1.7384	-.5405
55.11	1.6194	.1331	.7034	.4462	.6818	.3493	1.7306	-.5238
60.16	1.6719	.1287	.5724	.4496	.6870	.3355	1.7350	-.5130
65.22	1.7378	.1309	.4226	.4507	.6887	.3446	1.7549	-.4928
66.24	1.7411	.1317	.3973	.4505	.6884	.3379	1.7536	-.4829
68.26	1.7380	.1320	.3495	.4503	.6880	.3192	1.7438	-.4782
55.12	1.5908	.1404	.7052	.4422	.6758	.3313	1.7083	-.5144
65.99	1.8253	.1144	.4185	.4590	.7013	.3602	1.8377	-.5856
68.01	1.8091	.1150	.3412	.4584	.7005	.3611	1.8052	-.5664
70.04	1.7582	.1165	.2726	.4566	.6977	.3441	1.7456	-.5423
75.08	1.6926	.1226	.1004	.4526	.6916	.3387	1.6614	-.4828
80.12	1.6435	.1089	-.0513	.4567	.6978	.3326	1.6104	-.4447
85.15	1.7024	.0470	-.1689	.4819	.7364	.3122	1.6820	-.4768
90.09	1.7418	-.0134	.0552	.5050	.7717	-.0581	1.7417	-.4559
92.09	1.7583	-.0267	.1045	.5099	.7792	-.1686	1.7533	-.4764
80.13	1.6703	.1123	-.0536	.4560	.6968	.3391	1.6364	-.4528

$M_\infty = 0.79$ $Re_d = 0.46 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.06	.0107	.0273	1.3137	-1.7131	-1.9700	.0580	1.3125	-.3637
-.05	.0053	.0192	1.3200	-.6798	-.7818	.0066	1.3200	-.3659
1.95	.0001	.0108	1.3123	-75.8865	-87.2694	-.0444	1.3115	-.3836
3.95	-.0086	.0015	1.3248	.6512	.7489	-.0999	1.3211	-.3872
4.91	-.0149	-.0049	1.3187	.2119	.2437	-.1277	1.3126	-.3800
7.44	-.0282	-.0185	1.3115	-.0701	-.0806	-.1976	1.2968	-.3637
9.92	-.0458	-.0244	1.2865	.0365	.0420	-.2667	1.2594	-.3354
14.93	-.0025	-.0423	1.3267	-14.4086	-16.5699	-.3441	1.2813	-.4136
19.97	.1545	-.0756	1.3416	.9256	1.0645	-.3129	1.3137	-.4471
23.03	.3791	-.0824	1.2733	.6889	.7923	-.1491	1.3201	-.4229
19.84	.2756	-.0954	1.3010	.8010	.9212	-.1823	1.3173	-.4534
22.87	.4022	-.0899	1.3292	.6943	.7985	-.1460	1.3811	-.5437
24.92	.4918	-.0787	1.3150	.6391	.7349	-.1081	1.3997	-.5499
29.93	.6065	-.0487	1.2712	.5698	.6553	-.1087	1.4043	-.5233
34.98	.7054	-.0201	1.2290	.5247	.6035	-.1265	1.4114	-.5419
40.06	.9102	.0171	1.0804	.4836	.5562	.0012	1.4128	-.4918
43.09	1.0303	.0283	1.0409	.4761	.5475	.0413	1.4640	-.4773
45.12	1.0552	.0325	.9818	.4732	.5442	.0489	1.4405	-.4451
35.00	.7098	-.0191	1.2298	.5234	.6019	-.1239	1.4145	-.5432
42.92	1.0704	.0359	1.1059	.4708	.5415	.0309	1.5388	-.6003
44.96	1.1008	.0463	1.0550	.4634	.5330	.0335	1.5243	-.5816
49.98	1.1822	.0563	.9334	.4586	.5273	.0452	1.5056	-.5513
55.04	1.2030	.0581	.7569	.4580	.5267	.0690	1.4196	-.5640
60.04	1.2658	.0663	.5957	.4545	.5226	.1160	1.3941	-.5014
65.10	1.2989	.0744	.4516	.4502	.5177	.1374	1.3682	-.4807
66.12	1.2960	.0767	.4258	.4485	.5158	.1353	1.3575	-.4776
68.09	1.2932	.0805	.3964	.4459	.5128	.1148	1.3478	-.4853
54.99	1.1976	.0608	.7792	.4558	.5242	.0488	1.4280	-.5689
65.94	1.3246	.0686	.4357	.4550	.5232	.1421	1.3871	-.5401
67.97	1.3122	.0735	.3626	.4513	.5190	.1562	1.3524	-.5192
69.97	1.2956	.0813	.2928	.4454	.5122	.1687	1.3175	-.5007
75.02	1.2295	.0979	.1517	.4307	.4954	.1713	1.2269	-.4381
80.09	1.1772	.0824	-.0089	.4391	.5050	.2115	1.1581	-.4003
85.16	1.2195	.0384	-.1491	.4726	.5435	.2516	1.2026	-.4352
90.09	1.0184	-.0054	.0458	.5046	.5803	-.0473	1.0183	1.2421
92.05	1.2599	-.0167	.1122	.5115	.5883	-.1571	1.2551	-.4372
80.11	1.1904	.0832	-.0093	.4392	.5051	.2137	1.1711	-.4316

$M_\infty = 0.78$ $Re_d = 0.46 \times 10^6$ $L/d = 0.75$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.06	.0164	.0182	1.3409	-.9747	-.7310	.0647	1.3394	-.3956
-.06	.0134	.0125	1.3406	-.9277	-.6958	.0149	1.3406	-.3687
1.91	.0047	.0053	1.3483	-1.0005	-.7504	-.0403	1.3477	-.3954
3.94	-.0021	-.0024	1.3309	-.9973	-.7480	-.0936	1.3276	-.3990
4.95	-.0086	-.0053	1.3364	-.3257	-.2443	-.1239	1.3307	-.3961
7.41	-.0166	-.0152	1.3331	-.7211	-.5408	-.1883	1.3199	-.3886
9.92	-.0239	-.0158	1.3249	-.3839	-.2880	-.2518	1.3009	-.3881
14.92	-.0316	-.0252	1.3529	-.5628	-.4221	-.3789	1.2992	-.4410
19.95	.0150	-.0414	1.3573	4.1856	3.1392	-.4490	1.2810	-.4892
22.95	.1065	-.0574	1.3891	1.2185	.9139	-.4437	1.3207	-.5144
19.77	.0189	-.0444	1.3124	3.6221	2.7166	-.4261	1.2414	-.4165
22.79	.0998	-.0591	1.2974	1.2901	.9676	-.4106	1.2347	-.4072
24.79	.1589	-.0606	1.2981	1.0087	.7565	-.4000	1.2452	-.4129
29.86	.3019	-.0519	1.3004	.7291	.5468	-.3856	1.2781	-.5125
34.88	.3973	-.0439	1.2868	.6473	.4855	-.4100	1.2828	-.5273
39.94	.5023	-.0346	1.2423	.5919	.4439	-.4124	1.2750	-.5523
42.93	.5591	-.0285	1.2182	.5679	.4259	-.4203	1.2728	-.5657
44.94	.6027	-.0259	1.1949	.5574	.4181	-.4175	1.2715	-.5755
34.91	.3916	-.0407	1.2767	.6385	.4789	-.4095	1.2711	-.5327
34.91	.3962	-.0411	1.2881	.6383	.4787	-.4123	1.2831	-.5243
65.90	.8807	.0074	.4758	.4888	.3666	-.0748	.9982	-.5269
67.92	.8695	.0134	.4053	.4794	.3595	-.0488	.9581	-.5232
69.95	.8662	.0213	.3372	.4672	.3504	-.0199	.9293	-.5116
74.97	.8234	.0446	.1477	.4277	.3208	.0709	.8336	-.4620
80.06	.4748	.0389	.0034	.3908	.2931	.0787	.4682	.8821
85.08	.7687	.0319	-.1041	.4447	.3335	.1696	.7569	-.4089
90.03	1.3553	-.0252	.1186	.5248	.3936	-.1194	1.3553	-1.6116
92.04	.7830	-.0257	.1520	.5437	.4078	-.1798	.7771	-.3981
80.07	.7560	.0604	-.0102	.3934	.2951	.1405	.7429	-.3684

$M_\infty = 1.50$ $Re_d = 0.51 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.17	-.1068	-.0035	1.5936	.4789	.7317	-.0465	1.5965	-.2187
-.11	-.0120	-.0022	1.5618	.5074	.7753	-.0090	1.5618	-.1915
1.92	.0825	-.0046	1.5668	.5364	.8196	.0299	1.5687	-.1932
3.96	.1781	-.0063	1.5859	.5230	.7992	.0681	1.5944	-.2134
4.99	.2266	-.0060	1.6002	.5175	.7907	.0864	1.6139	-.2248
7.53	.3476	-.0093	1.6229	.5175	.7908	.1320	1.6544	-.2464
10.10	.4765	-.0520	1.6125	.5714	.8731	.1864	1.6710	-.2589
15.17	.6777	-.0783	1.6521	.5756	.8796	.2217	1.7719	-.2948
20.28	.9076	-.0643	1.6610	.5463	.8348	.2755	1.8727	-.3392
23.35	1.0570	-.0440	1.6316	.5272	.8056	.3238	1.9169	-.3263
-.13	-.0112	-.0007	1.5559	.5074	.7753	-.0076	1.5559	-.1920
19.88	.8483	-.0878	1.6454	.5677	.8675	.2382	1.8358	-.3236
22.95	.9931	-.0682	1.6283	.5449	.8326	.2795	1.8867	-.3316
24.97	1.0696	-.0503	1.6076	.5308	.8110	.2910	1.9088	-.3339
30.11	1.3265	-.0011	1.5556	.5006	.7649	.3670	2.0112	-.3260
35.21	1.5530	.0421	1.4789	.4823	.7369	.4163	2.1038	-.3155
40.35	1.8336	.0760	1.4496	.4729	.7225	.4588	2.2919	-.3267
43.45	1.9906	.0899	1.4260	.4704	.7188	.4643	2.4043	-.3460
45.50	2.0843	.0950	1.4054	.4702	.7184	.4584	2.4717	-.3613
35.25	1.5764	.0431	1.5007	.4821	.7366	.4213	2.1353	-.3147
42.95	1.8483	.0709	1.4208	.4749	.7256	.3848	2.2993	-.3188
44.99	1.9252	.0945	1.3832	.4679	.7149	.3836	2.3393	-.3249
50.06	2.0964	.1124	1.2802	.4649	.7104	.3643	2.4292	-.3445
55.14	2.2399	.1217	1.1664	.4644	.7097	.3230	2.5046	-.3475
60.25	2.3289	.1195	1.0272	.4664	.7127	.2637	2.5317	-.3503
65.32	2.4400	.1198	.9074	.4679	.7149	.1942	2.5961	-.3745
66.32	2.4368	.1190	.8699	.4680	.7152	.1821	2.5810	-.3795
68.36	2.4793	.1204	.8106	.4682	.7154	.1607	2.6035	-.3825
55.14	2.2323	.1222	1.1629	.4642	.7092	.3215	2.4965	-.3455
65.86	2.2897	.1127	.8124	.4678	.7148	.1948	2.4217	-.3103
67.91	2.3263	.1125	.7472	.4683	.7156	.1827	2.4365	-.3196
69.93	2.3784	.1136	.6854	.4687	.7162	.1725	2.4692	-.3332
75.02	2.4755	.1123	.5503	.4703	.7186	.1081	2.5336	-.3597
80.08	2.5728	.0894	.4186	.4773	.7292	.0307	2.6065	-.3912
85.15	2.5688	.0529	.2056	.4865	.7434	.0123	2.5770	-.3742
90.22	2.4597	-.0132	-.0028	.5035	.7694	-.0068	2.4597	-.3383
92.28	2.4960	-.0314	-.0865	.5082	.7766	-.0128	2.4975	-.3475
80.07	2.5906	.0904	.4210	.4772	.7291	.0323	2.6244	-.3924

$M_\infty = 1.50$ $Re_d = 0.99 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.37	-.1204	-.0026	1.6029	.4856	.7420	-.0540	1.6065	-.2449
-.27	-.0271	.0015	1.5695	.4862	.7429	-.0197	1.5696	-.2050
1.81	.0664	.0029	1.5744	.4714	.7203	.0165	1.5758	-.2039
3.91	.1622	.0035	1.5947	.4858	.7423	.0532	1.6020	-.2242
4.96	.2123	.0040	1.6103	.4877	.7453	.0724	1.6226	-.2335
7.55	.3374	.0052	1.6278	.4899	.7486	.1206	1.6580	-.2602
10.16	.4821	-.0517	1.6352	.5702	.8713	.1860	1.6946	-.2734
15.33	.6767	-.0816	1.6508	.5789	.8846	.2161	1.7710	-.3053
20.55	.9115	-.0767	1.6831	.5551	.8481	.2626	1.8960	-.3583
23.67	1.0685	-.0619	1.6654	.5379	.8219	.3099	1.9543	-.3727
-.27	-.0265	.0023	1.5754	.4862	.7429	-.0191	1.5755	-.2037
19.79	.8286	-.0940	1.6268	.5743	.8775	.2289	1.8112	-.3335
22.89	.9805	-.0756	1.6210	.5505	.8412	.2727	1.8747	-.3325
24.98	1.0742	-.0566	1.6011	.5345	.8167	.2974	1.9050	-.3353
30.23	1.3265	-.0008	1.5408	.5004	.7646	.3704	1.9991	-.3343
35.46	1.5931	.0441	1.4931	.4819	.7363	.4314	2.1404	-.3215
40.69	1.8589	.0691	1.4570	.4757	.7268	.4594	2.3167	-.3452
43.87	2.0012	.0860	1.4163	.4719	.7210	.4613	2.4079	-.3556
45.93	2.0823	.0957	1.3798	.4699	.7180	.4570	2.4558	-.3627
35.48	1.5985	.0436	1.4953	.4822	.7367	.4337	2.1455	-.3228
42.88	1.8673	.0682	1.4356	.4761	.7275	.3916	2.3226	-.3269
44.98	1.9237	.0863	1.3797	.4706	.7191	.3856	2.3357	-.3401
50.15	2.1148	.1136	1.2890	.4649	.7103	.3653	2.4496	-.3463
55.29	2.2325	.1193	1.1599	.4650	.7106	.3176	2.4957	-.3484
60.46	2.3594	.1186	1.0355	.4671	.7138	.2623	2.5633	-.3564
65.62	2.4341	.1180	.8864	.4683	.7155	.1972	2.5830	-.3786
66.65	2.4544	.1189	.8559	.4683	.7156	.1871	2.5926	-.3828
68.71	2.4875	.1207	.7908	.4682	.7155	.1663	2.6049	-.3861
55.31	2.2279	.1188	1.1525	.4651	.7107	.3201	2.4879	-.3507
65.73	2.3329	.1082	.8399	.4696	.7176	.1932	2.4720	-.3298
67.80	2.3512	.1100	.7630	.4694	.7172	.1819	2.4652	-.3305
69.86	2.4005	.1111	.6974	.4697	.7177	.1720	2.4938	-.3452
74.99	2.4745	.1077	.5492	.4715	.7205	.1106	2.5323	-.3646
80.13	2.5707	.0820	.4172	.4791	.7321	.0298	2.6041	-.3999
85.30	2.5467	.0424	.1967	.4891	.7473	.0126	2.5542	-.3781
90.45	2.4582	-.0251	-.0220	.5067	.7742	.0027	2.4583	-.3456
92.51	2.4722	-.0424	-.1104	.5112	.7811	.0019	2.4747	-.3596
80.12	2.5942	.0823	.4195	.4792	.7323	.0318	2.6278	-.3995

$M_\infty = 1.50$ $Re_d = 1.01 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.33	-.1038	.0090	1.6211	.5753	.6615	-.0379	1.6240	-.2494
-.24	-.0161	.0009	1.5727	.5982	.6879	-.0094	1.5727	-.2243
1.81	.0678	-.0096	1.5744	.6225	.7158	.0182	1.5757	-.2177
3.90	.1540	-.0198	1.5906	.6117	.7035	.0455	1.5974	-.2297
4.94	.1969	-.0246	1.5962	.6085	.6998	.0586	1.6072	-.2363
7.50	.3030	-.0341	1.6148	.5977	.6874	.0895	1.6406	-.2613
10.00	.3257	-.0778	1.6307	.7077	.8138	.0376	1.6625	-.2776
15.18	.5042	-.0850	1.6430	.6466	.7436	.0565	1.7177	-.3009
20.34	.7018	-.0821	1.6624	.6017	.6920	.0801	1.8027	-.3436
23.46	.8285	-.0740	1.6591	.5776	.6643	.0994	1.8518	-.3660
-.24	-.0160	.0021	1.5805	.5982	.6879	-.0094	1.5806	-.2276
19.62	.6254	-.0874	1.6332	.6216	.7148	.0406	1.7484	-.3272
22.75	.7518	-.0790	1.6247	.5914	.6801	.0651	1.7890	-.3270
24.81	.8226	-.0680	1.5943	.5718	.6576	.0777	1.7923	-.3271
29.99	1.0220	-.0480	1.5750	.5408	.6220	.0979	1.8750	-.3264
35.21	1.2587	-.0155	1.5113	.5107	.5873	.1572	1.9605	-.3123
40.38	1.4363	.0043	1.4603	.4974	.5720	.1482	2.0429	-.3485
43.47	1.5406	.0173	1.4221	.4903	.5638	.1397	2.0920	-.3618
45.56	1.6196	.0280	1.4044	.4849	.5577	.1312	2.1397	-.3704
35.21	1.2544	-.0152	1.5077	.5105	.5871	.1555	1.9551	-.3133
42.62	1.4955	.0043	1.4885	.4975	.5722	.0924	2.1079	-.3818
44.69	1.5372	.0121	1.4468	.4931	.5671	.0754	2.1096	-.3772
49.83	1.6408	.0419	1.3234	.4778	.5495	.0469	2.1075	-.3515
54.99	1.7277	.0517	1.1785	.4740	.5451	.0259	2.0912	-.3470
60.14	1.8150	.0552	1.0542	.4736	.5446	-.0106	2.0989	-.3688
65.26	1.8536	.0632	.9091	.4703	.5409	-.0501	2.0640	-.3862
66.26	1.8550	.0652	.8747	.4694	.5399	-.0540	2.0501	-.3869
68.37	1.8677	.0707	.8107	.4671	.5371	-.0653	2.0350	-.3860
54.99	1.7178	.0528	1.1729	.4733	.5443	.0248	2.0798	-.3475
65.52	1.8117	.0586	.9081	.4719	.5427	-.0758	2.0252	-.3548
67.59	1.8152	.0650	.8312	.4688	.5392	-.0765	1.9950	-.3552
69.69	1.8301	.0724	.7555	.4656	.5354	-.0732	1.9785	-.3544
74.85	1.8716	.0831	.5793	.4614	.5306	-.0701	1.9580	-.3740
79.97	1.9215	.0599	.4338	.4729	.5438	-.0925	1.9677	-.3929
85.16	1.9034	.0312	.2044	.4858	.5586	-.0431	1.9139	-.3744
90.33	1.8431	-.0063	-.0251	.5030	.5784	.0145	1.8432	-.3450
92.40	1.8622	-.0189	-.1134	.5088	.5852	.0354	1.8653	-.3562
79.95	1.9378	.0610	.4370	.4726	.5435	-.0922	1.9844	-.3915

$M_\infty = 1.50$ $Re_d = 0.98 \times 10^6$ L/d = 0.75

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.28	-.0732	.0206	1.6280	.8745	.6559	-.0084	1.6296	-.2652
-.25	-.0169	.0089	1.6222	.7770	.5828	-.0099	1.6223	-.2589
1.80	.0403	-.0030	1.6021	.5991	.4494	-.0102	1.6026	-.2492
3.85	.0968	-.0147	1.6075	.7032	.5274	-.0113	1.6104	-.2533
4.88	.1257	-.0202	1.6254	.7139	.5354	-.0130	1.6302	-.2603
7.25	.0231	-.0250	1.6771	1.9384	1.4538	-.1886	1.6667	-.3061
9.80	.0760	-.0357	1.6841	1.1259	.8444	-.2116	1.6724	-.3261
14.90	.2116	-.0548	1.6742	.8452	.6339	-.2261	1.6723	-.3371
20.08	.3743	-.0634	1.6504	.7258	.5443	-.2150	1.6787	-.3510
23.16	.4850	-.0650	1.6443	.6788	.5091	-.2007	1.7025	-.3592
-.24	-.0177	.0093	1.6084	.7770	.5828	-.0109	1.6085	-.2580
19.44	.3583	-.0683	1.6403	.7542	.5656	-.2079	1.6660	-.3481
22.51	.4407	-.0706	1.6336	.7137	.5353	-.2184	1.6779	-.3463
24.57	.5182	-.0679	1.6166	.6747	.5060	-.2009	1.6857	-.3496
29.68	.6729	-.0573	1.6025	.6135	.4601	-.2087	1.7255	-.3677
34.89	.8559	-.0434	1.5293	.5676	.4257	-.1727	1.7440	-.3511
39.98	.9871	-.0331	1.4940	.5447	.4085	-.2035	1.7790	-.3791
43.05	1.0471	-.0276	1.4618	.5351	.4013	-.2328	1.7830	-.3916
45.10	1.0756	-.0228	1.4338	.5282	.3962	-.2564	1.7739	-.4019
34.88	.8590	-.0430	1.5361	.5668	.4251	-.1736	1.7514	-.3502
42.40	1.0123	-.0271	1.4631	.5357	.4018	-.2392	1.7630	-.3818
44.40	1.0490	-.0224	1.4362	.5291	.3968	-.2555	1.7600	-.3843
49.53	1.1278	-.0137	1.3569	.5161	.3871	-.3002	1.7387	-.3889
54.62	1.1878	-.0055	1.2554	.5062	.3797	-.3357	1.6954	-.4073
59.77	1.2167	.0028	1.1185	.4969	.3727	-.3537	1.6143	-.4036
64.87	1.2083	.0147	.9468	.4837	.3628	-.3440	1.4961	-.3863
65.92	1.2002	.0185	.9052	.4795	.3596	-.3366	1.4651	-.3835
67.95	1.2114	.0259	.8417	.4714	.3536	-.3255	1.4387	-.3831
54.66	1.1806	-.0046	1.2463	.5052	.3789	-.3338	1.6840	-.4079
65.35	1.1998	.0181	.9368	.4798	.3599	-.3510	1.4812	-.3832
67.44	1.2082	.0253	.8699	.4721	.3541	-.3400	1.4495	-.3778
69.48	1.2161	.0329	.8071	.4639	.3479	-.3297	1.4218	-.3788
74.64	1.2266	.0479	.6347	.4479	.3359	-.2871	1.3509	-.3997
79.83	1.2252	.0335	.4485	.4635	.3476	-.2250	1.2852	-.3762
85.03	1.2076	.0170	.2043	.4812	.3609	-.0990	1.2208	-.3678
90.24	1.1863	-.0009	-.0329	.5010	.3757	.0280	1.1864	-.3282
92.31	1.1917	-.0073	-.1261	.5082	.3811	.0780	1.1958	-.3365
79.80	1.2294	.0343	.4508	.4628	.3471	-.2260	1.2898	-.3780

$M_\infty = 1.50$ $Re_d = 1.34 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.50	-.1291	-.0013	1.6244	.4933	.7538	-.0581	1.6285	-.2532
-.37	-.0330	.0027	1.5659	.4833	.7385	-.0230	1.5661	-.2040
1.76	.0630	.0048	1.5734	.4500	.6876	.0147	1.5746	-.2072
3.87	.1600	.0061	1.5980	.4749	.7256	.0519	1.6051	-.2248
4.92	.2088	.0069	1.6019	.4783	.7308	.0707	1.6139	-.2365
7.57	.3380	.0086	1.6338	.4834	.7386	.1199	1.6641	-.2597
10.23	.4752	.0072	1.6465	.4901	.7489	.1753	1.7047	-.2857
15.43	.6811	-.0848	1.6553	.5814	.8884	.2161	1.7769	-.3069
20.74	.9246	-.0793	1.6862	.5561	.8497	.2676	1.9043	-.3620
23.92	1.0882	-.0657	1.6705	.5395	.8243	.3174	1.9683	-.3771
-.37	-.0290	.0014	1.5690	.4833	.7385	-.0190	1.5692	-.2053
19.59	.8293	-.0975	1.6466	.5770	.8816	.2293	1.8293	-.3280
22.87	.9808	-.0783	1.6229	.5523	.8439	.2729	1.8765	-.3259
25.02	1.0856	-.0581	1.6141	.5351	.8176	.3012	1.9217	-.3276
30.35	1.3428	-.0003	1.5437	.5001	.7642	.3789	2.0106	-.3275
35.66	1.5978	.0445	1.4771	.4818	.7362	.4371	2.1317	-.3136
41.01	1.8768	.0685	1.4516	.4761	.7275	.4637	2.3269	-.3427
44.17	2.0307	.0849	1.4188	.4726	.7222	.4679	2.4327	-.3537
46.30	2.1058	.0930	1.3754	.4711	.7198	.4605	2.4727	-.3584
35.70	1.6208	.0442	1.4926	.4821	.7367	.4451	2.1579	-.3167
42.85	1.8667	.0678	1.4305	.4762	.7277	.3957	2.3182	-.3302
44.98	1.9479	.0860	1.3954	.4711	.7198	.3915	2.3639	-.3456
50.20	2.1224	.1103	1.2830	.4660	.7120	.3727	2.4519	-.3492
55.43	2.2627	.1182	1.1588	.4658	.7117	.3297	2.5207	-.3542
60.65	2.3601	.1154	1.0212	.4680	.7151	.2667	2.5577	-.3632
65.86	2.4661	.1176	.8824	.4688	.7163	.2031	2.6113	-.3841
66.88	2.4764	.1176	.8474	.4689	.7165	.1930	2.6102	-.3905
68.98	2.4953	.1193	.7798	.4687	.7162	.1670	2.6090	-.3932
55.44	2.2807	.1187	1.1656	.4659	.7119	.3340	2.5394	-.3521
65.61	2.3771	.1084	.8584	.4702	.7184	.1997	2.5195	-.3360
67.67	2.4001	.1102	.7884	.4699	.7181	.1825	2.5196	-.3476
69.78	2.4199	.1126	.7055	.4695	.7174	.1742	2.5146	-.3504
74.99	2.5164	.1053	.5702	.4726	.7222	.1008	2.5783	-.3695
80.15	2.5721	.0816	.4169	.4792	.7323	.0295	2.6055	-.3970
85.40	2.5620	.0416	.1915	.4894	.7478	.0146	2.5692	-.3733
90.61	2.4750	-.0291	-.0343	.5077	.7758	.0078	2.4752	-.3482
92.73	2.4847	-.0456	-.1251	.5120	.7823	.0068	2.4878	-.3609
80.16	2.5828	.0807	.4149	.4796	.7328	.0326	2.6157	-.3970

$M_\infty = 1.76$ $Re_d = 1.01 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.34	-.0980	.0145	1.6608	.5972	.9125	-.0301	1.6634	-.1800
-.23	-.0077	.0114	1.6303	.5197	.7941	-.0010	1.6303	-.1578
1.83	.0788	.0087	1.6355	.4278	.6537	.0264	1.6372	-.1636
3.89	.1666	.0066	1.6533	.4739	.7241	.0541	1.6608	-.1822
4.95	.2113	.0053	1.6547	.4835	.7388	.0677	1.6668	-.1893
7.52	.3197	.0014	1.6643	.4971	.7596	.0990	1.6918	-.2118
10.13	.4382	-.0236	1.6638	.5352	.8178	.1387	1.7150	-.2115
15.32	.6435	-.0545	1.6567	.5554	.8487	.1829	1.7679	-.2319
20.50	.8549	-.0536	1.6580	.5410	.8267	.2202	1.8524	-.2676
23.66	1.0062	-.0435	1.6381	.5283	.8073	.2641	1.9043	-.2668
-.27	-.0083	.0112	1.6380	.5197	.7941	-.0006	1.6380	-.1581
19.73	.7647	-.0765	1.6477	.5655	.8640	.1635	1.8091	-.2490
22.87	.9184	-.0602	1.6294	.5429	.8295	.2131	1.8582	-.2534
24.96	1.0072	-.0475	1.6002	.5309	.8112	.2380	1.8757	-.2549
30.19	1.2630	-.0114	1.5428	.5059	.7730	.3160	1.9687	-.2486
35.41	1.4963	.0166	1.4756	.4927	.7529	.3644	2.0697	-.2490
40.63	1.7392	.0382	1.4364	.4856	.7420	.3846	2.2226	-.2646
43.78	1.8863	.0501	1.4093	.4826	.7375	.3866	2.3227	-.2751
45.84	1.9903	.0579	1.3834	.4809	.7349	.3941	2.3916	-.2793
35.42	1.5018	.0166	1.4802	.4928	.7529	.3658	2.0766	-.2499
42.85	1.8155	.0575	1.4450	.4793	.7324	.3483	2.2941	-.2515
44.94	1.8958	.0756	1.3981	.4739	.7241	.3543	2.3288	-.2593
50.12	2.0750	.0976	1.2798	.4692	.7170	.3481	2.4130	-.2644
55.31	2.2167	.1003	1.1494	.4704	.7188	.3165	2.4769	-.2704
60.46	2.3267	.0976	1.0128	.4725	.7221	.2659	2.5236	-.2822
65.66	2.4124	.1037	.8531	.4719	.7210	.2172	2.5496	-.2954
66.67	2.4388	.1046	.8188	.4719	.7211	.2139	2.5637	-.2989
68.75	2.4639	.1061	.7443	.4718	.7209	.1993	2.5662	-.3000
55.33	2.2064	.0995	1.1407	.4705	.7189	.3171	2.4635	-.2692
65.77	2.3593	.0988	.7903	.4726	.7221	.2477	2.4758	-.2685
67.85	2.3744	.0970	.7054	.4733	.7231	.2421	2.4651	-.2653
69.88	2.4020	.0964	.6528	.4737	.7239	.2134	2.4800	-.2651
75.01	2.5008	.0889	.5246	.4767	.7284	.1399	2.5514	-.2893
80.16	2.5410	.0617	.3725	.4841	.7397	.0675	2.5672	-.2865
85.32	2.5437	.0265	.1728	.4932	.7536	.0353	2.5493	-.2941
90.48	2.4776	-.0197	-.0322	.5052	.7719	.0113	2.4778	-.2585
92.54	2.4975	-.0348	-.1138	.5091	.7779	.0028	2.5000	-.2711
80.14	2.5473	.0615	.3735	.4842	.7399	.0680	2.5736	-.2841

$M_\infty = 1.99$ $Re_d = 0.52 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.20	-.0834	.0042	1.6618	.5328	.8141	-.0196	1.6638	-.1591
-.16	-.0030	-.0039	1.6392	.5692	.8698	.0015	1.6392	-.1457
1.88	.0762	-.0131	1.6365	.6125	.9358	.0276	1.6381	-.1388
3.91	.1546	-.0207	1.6481	.5877	.8980	.0418	1.6548	-.1519
4.94	.1930	-.0237	1.6524	.5802	.8866	.0501	1.6629	-.1566
7.48	.2898	-.0332	1.6578	.5750	.8787	.0715	1.6814	-.1637
10.03	.3830	-.0440	1.6565	.5752	.8789	.0885	1.6979	-.1744
15.12	.5722	-.0695	1.6592	.5795	.8855	.1197	1.7510	-.1988
20.22	.7503	-.0587	1.6271	.5512	.8423	.1417	1.7862	-.2083
23.27	.8690	-.0523	1.6083	.5394	.8242	.1629	1.8208	-.2205
-.13	.0024	-.0067	1.6461	.5692	.8698	.0060	1.6461	-.1480
19.84	.7023	-.0621	1.6413	.5579	.8524	.1035	1.7822	-.2166
24.94	.9151	-.0464	1.5998	.5332	.8147	.1551	1.8365	-.2157
22.90	.8337	-.0509	1.6226	.5399	.8250	.1367	1.8192	-.2168
30.04	1.1462	-.0234	1.5352	.5134	.7845	.2236	1.9027	-.2134
35.18	1.3738	.0006	1.4722	.4997	.7636	.2746	1.9948	-.2104
40.27	1.6115	.0236	1.4212	.4904	.7493	.3110	2.1261	-.2197
43.31	1.7487	.0329	1.3871	.4877	.7452	.3209	2.2089	-.2342
45.37	1.8444	.0387	1.3637	.4863	.7430	.3253	2.2706	-.2423
35.14	1.3811	.0007	1.4835	.4997	.7635	.2755	2.0081	-.2128
42.91	1.7570	.0405	1.4433	.4849	.7409	.3042	2.2534	-.2211
44.94	1.8431	.0471	1.4062	.4833	.7385	.3114	2.2973	-.2202
50.02	2.0150	.0574	1.2807	.4813	.7355	.3132	2.3669	-.2255
55.14	2.1599	.0637	1.1293	.4807	.7345	.3078	2.4178	-.2286
60.22	2.2849	.0726	.9806	.4792	.7322	.2836	2.4702	-.2319
65.31	2.3891	.0795	.8100	.4782	.7307	.2621	2.5090	-.2437
66.34	2.3996	.0806	.7712	.4780	.7304	.2568	2.5074	-.2476
68.38	2.4283	.0839	.6947	.4774	.7294	.2491	2.5134	-.2495
55.14	2.1668	.0640	1.1329	.4807	.7345	.3088	2.4255	-.2292
65.88	2.3340	.0747	.7585	.4790	.7320	.2615	2.4401	-.2293
67.94	2.3482	.0770	.6777	.4785	.7312	.2540	2.4308	-.2277
69.96	2.3735	.0757	.6054	.4791	.7321	.2445	2.4373	-.2263
75.04	2.4583	.0700	.4600	.4814	.7355	.1901	2.4938	-.2372
80.11	2.4904	.0538	.3072	.4859	.7424	.1250	2.5062	-.2401
85.16	2.5039	.0217	.1568	.4943	.7553	.0548	2.5082	-.2424
90.24	2.4400	-.0172	-.0089	.5046	.7711	-.0012	2.4400	-.2156
92.26	2.4475	-.0304	-.0741	.5081	.7764	-.0224	2.4485	-.2198
80.10	2.4972	.0546	.3098	.4857	.7421	.1241	2.5133	-.2373

$M_\infty = 2.00$ $Re_d = 0.98 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.33	-.0891	-.0000	1.6709	.4999	.7638	-.0211	1.6731	-.1622
-.26	-.0108	-.0050	1.6502	.5475	.8366	-.0033	1.6502	-.1492
1.78	.0656	-.0115	1.6511	.6146	.9392	.0142	1.6524	-.1400
3.87	.1416	-.0164	1.6552	.5760	.8801	.0296	1.6610	-.1516
4.88	.1796	-.0188	1.6632	.5684	.8685	.0374	1.6724	-.1565
7.47	.2755	-.0233	1.6626	.5553	.8485	.0569	1.6843	-.1694
10.05	.3740	-.0299	1.6710	.5524	.8441	.0767	1.7106	-.1778
15.23	.5664	-.0478	1.6751	.5553	.8484	.1064	1.7651	-.2001
20.40	.7551	-.0547	1.6437	.5474	.8365	.1348	1.8038	-.2114
23.52	.8915	-.0507	1.6420	.5372	.8209	.1621	1.8613	-.2275
-.26	-.0090	-.0060	1.6509	.5475	.8366	-.0015	1.6509	-.1477
19.69	.6994	-.0549	1.6623	.5561	.8497	.0986	1.8008	-.2072
22.78	.8205	-.0541	1.6442	.5432	.8299	.1199	1.8336	-.2141
24.86	.9127	-.0427	1.6172	.5306	.8108	.1483	1.8510	-.2101
30.11	1.1476	-.0209	1.5555	.5119	.7822	.2125	1.9213	-.2036
35.29	1.3869	.0005	1.4959	.4998	.7636	.2679	2.0222	-.2097
40.54	1.6298	.0271	1.4329	.4891	.7474	.3072	2.1482	-.2215
43.69	1.7691	.0378	1.3887	.4860	.7427	.3201	2.2261	-.2265
45.77	1.8559	.0440	1.3502	.4845	.7403	.3273	2.2716	-.2357
35.32	1.3945	.0004	1.5004	.4998	.7637	.2702	2.0305	-.2100
42.79	1.7412	.0340	1.4504	.4872	.7445	.2925	2.2472	-.2160
44.90	1.8158	.0401	1.4022	.4855	.7419	.2966	2.2749	-.2208
50.07	2.0111	.0571	1.2873	.4814	.7356	.3038	2.3684	-.2275
55.28	2.1658	.0648	1.1256	.4804	.7341	.3083	2.4212	-.2298
60.47	2.2868	.0710	.9592	.4797	.7330	.2924	2.4626	-.2363
65.67	2.3949	.0764	.7840	.4791	.7321	.2722	2.5052	-.2486
66.68	2.4116	.0769	.7487	.4791	.7321	.2670	2.5110	-.2511
68.79	2.4477	.0786	.6751	.4790	.7319	.2564	2.5261	-.2527
55.27	2.1608	.0646	1.1248	.4804	.7341	.3066	2.4166	-.2299
65.77	2.3306	.0805	.7686	.4774	.7295	.2558	2.4407	-.2334
67.84	2.3554	.0828	.6899	.4770	.7288	.2495	2.4416	-.2267
69.91	2.3893	.0824	.6173	.4774	.7295	.2409	2.4559	-.2271
75.04	2.4727	.0758	.4786	.4799	.7333	.1757	2.5124	-.2387
80.18	2.5171	.0548	.3135	.4857	.7422	.1203	2.5337	-.2386
85.34	2.5192	.0217	.1490	.4944	.7554	.0564	2.5229	-.2435
90.45	2.4660	-.0154	-.0176	.5041	.7702	-.0019	2.4660	-.2199
92.51	2.4606	-.0285	-.0853	.5076	.7756	-.0224	2.4619	-.2224
80.18	2.5158	.0546	.3126	.4858	.7423	.1210	2.5322	-.2386

$M_\infty = 2.00$ $Re_d = 0.98 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.35	-.0869	.0137	1.6752	.6370	.7326	-.0180	1.6774	-.1729
-.29	-.0198	.0027	1.6601	.6448	.7415	-.0115	1.6602	-.1580
1.78	.0459	-.0083	1.6572	.6580	.7568	-.0056	1.6578	-.1515
3.84	.1108	-.0192	1.6648	.6508	.7484	-.0009	1.6684	-.1500
4.84	.1428	-.0238	1.6714	.6449	.7417	.0011	1.6775	-.1534
7.40	.2215	-.0336	1.6703	.6318	.7265	.0045	1.6849	-.1640
9.98	.3021	-.0423	1.6814	.6219	.7152	.0062	1.7083	-.1699
15.09	.4442	-.0555	1.6762	.6088	.7001	-.0075	1.7340	-.1837
20.23	.5800	-.0620	1.6593	.5929	.6819	-.0296	1.7575	-.2116
23.31	.6810	-.0612	1.6410	.5781	.6648	-.0241	1.7765	-.2234
-.28	-.0193	.0026	1.6672	.6448	.7415	-.0113	1.6672	-.1567
19.55	.5249	-.0594	1.6727	.5984	.6881	-.0650	1.7519	-.2029
22.63	.6238	-.0583	1.6498	.5812	.6684	-.0592	1.7628	-.2090
24.70	.6927	-.0564	1.6439	.5708	.6564	-.0576	1.7829	-.2109
29.87	.8769	-.0460	1.5935	.5456	.6275	-.0333	1.8185	-.1997
35.04	1.0853	-.0301	1.5365	.5241	.6027	.0062	1.8812	-.2081
40.26	1.2801	-.0097	1.4718	.5066	.5826	.0257	1.9504	-.2275
43.34	1.3847	.0002	1.4247	.4999	.5749	.0293	1.9866	-.2360
45.42	1.4443	.0060	1.3822	.4964	.5708	.0294	1.9989	-.2396
35.09	1.0829	-.0300	1.5324	.5241	.6027	.0050	1.8764	-.2135
42.58	1.3318	-.0010	1.4569	.5006	.5757	-.0052	1.9739	-.2396
44.65	1.4072	.0045	1.4308	.4972	.5718	-.0046	2.0068	-.2460
49.81	1.5491	.0195	1.3102	.4891	.5624	-.0012	2.0288	-.2399
54.99	1.6496	.0312	1.1445	.4835	.5561	.0090	2.0077	-.2317
60.18	1.7421	.0402	.9740	.4800	.5519	.0213	1.9957	-.2408
65.32	1.7863	.0501	.7911	.4756	.5470	.0269	1.9534	-.2454
66.39	1.7914	.0514	.7517	.4751	.5463	.0288	1.9425	-.2461
68.45	1.8171	.0546	.6877	.4739	.5449	.0278	1.9426	-.2479
54.99	1.6544	.0319	1.1486	.4832	.5557	.0085	2.0140	-.2309
65.62	1.7793	.0540	.7966	.4736	.5446	.0087	1.9495	-.2189
67.73	1.7986	.0588	.7178	.4716	.5423	.0175	1.9365	-.2239
69.76	1.8224	.0618	.6464	.4705	.5411	.0239	1.9334	-.2312
74.92	1.8783	.0614	.4888	.4716	.5423	.0167	1.9408	-.2406
78.03	1.8884	.0517	.3917	.4762	.5476	.0085	1.9286	-.2453
80.07	1.8910	.0440	.3212	.4798	.5518	.0097	1.9181	-.2430
85.23	1.9056	.0221	.1543	.4899	.5634	.0047	1.9118	-.2378
90.35	1.8566	-.0032	-.0119	.5015	.5767	.0004	1.8566	-.2174
92.40	1.8671	-.0124	-.0797	.5058	.5816	.0013	1.8688	-.2270
80.07	1.8941	.0436	.3206	.4800	.5520	.0108	1.9210	-.2431

$M_\infty = 2.00$ $Re_d = 0.98 \times 10^6$ $L/d = 0.75$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.30	-.0501	.0126	1.6802	.8352	.6264	.0175	1.6808	-.1742
-.24	-.0060	.0014	1.6856	.8441	.6331	.0010	1.6856	-.1743
1.78	.0365	-.0101	1.6826	.8707	.6530	-.0159	1.6829	-.1683
3.82	.0777	-.0202	1.6846	.8468	.6351	-.0346	1.6861	-.1743
4.80	.0954	-.0247	1.6874	.8455	.6341	-.0461	1.6894	-.1797
7.37	.1303	-.0311	1.6885	.8184	.6138	-.0873	1.6913	-.1837
9.89	.1559	-.0384	1.7001	.8283	.6213	-.1383	1.7017	-.1977
14.93	.2303	-.0507	1.6862	.7938	.5954	-.2119	1.6886	-.2113
20.03	.3462	-.0572	1.6609	.7204	.5403	-.2438	1.6790	-.2218
23.11	.4157	-.0580	1.6384	.6861	.5146	-.2607	1.6700	-.2276
-.28	-.0082	.0029	1.6861	.8441	.6331	.0001	1.6862	-.1737
19.41	.3310	-.0549	1.6631	.7210	.5408	-.2404	1.6786	-.2184
22.45	.4004	-.0575	1.6575	.6913	.5185	-.2630	1.6848	-.2162
24.52	.4518	-.0574	1.6451	.6695	.5021	-.2716	1.6842	-.2211
29.62	.5870	-.0552	1.6161	.6254	.4691	-.2884	1.6951	-.2317
34.75	.7230	-.0481	1.5675	.5887	.4415	-.2992	1.7001	-.2348
39.92	.8631	-.0365	1.4942	.5565	.4173	-.2971	1.6998	-.2318
42.99	.9271	-.0283	1.4338	.5406	.4055	-.2994	1.6809	-.2407
45.05	.9690	-.0221	1.3969	.5304	.3978	-.3040	1.6727	-.2490
34.76	.7246	-.0476	1.5689	.5876	.4407	-.2991	1.7021	-.2336
42.39	.9166	-.0293	1.4459	.5426	.4070	-.2979	1.6858	-.2346
44.45	.9597	-.0246	1.4070	.5342	.4006	-.3001	1.6765	-.2382
49.57	1.0532	-.0142	1.3074	.5180	.3885	-.3122	1.6496	-.2507
54.71	1.1185	-.0043	1.1738	.5051	.3788	-.3119	1.5911	-.2462
59.86	1.1428	.0067	.9941	.4922	.3691	-.2860	1.4874	-.2454
65.01	1.1556	.0205	.8029	.4764	.3573	-.2396	1.3866	-.2400
66.03	1.1584	.0229	.7690	.4736	.3552	-.2321	1.3709	-.2418
68.09	1.1739	.0261	.7083	.4703	.3527	-.2190	1.3535	-.2449
54.68	1.1123	-.0045	1.1667	.5054	.3791	-.3089	1.5821	-.2443
65.47	1.1616	.0227	.8047	.4740	.3555	-.2497	1.3909	-.2371
67.57	1.1759	.0269	.7371	.4695	.3521	-.2326	1.3682	-.2434
69.62	1.1831	.0311	.6669	.4650	.3488	-.2130	1.3413	-.2465
74.74	1.1975	.0342	.5005	.4619	.3464	-.1675	1.2870	-.2420
79.89	1.2193	.0251	.3285	.4726	.3544	-.1093	1.2580	-.2517
85.08	1.2019	.0119	.1510	.4868	.3651	-.0473	1.2104	-.2314
90.20	1.1828	-.0022	-.0152	.5025	.3769	.0111	1.1829	-.2116
92.26	1.1867	-.0078	-.0835	.5088	.3816	.0367	1.1891	-.2188
79.90	1.2126	.0254	.3263	.4721	.3541	-.1086	1.2510	-.2462

$M_\infty = 2.00$ $Re_d = 1.48 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.54	-.0979	-.0002	1.6785	.4984	.7615	-.0234	1.6812	-.1686
-.43	-.0193	-.0042	1.6620	.5358	.8186	-.0067	1.6621	-.1520
1.69	.0574	-.0089	1.6520	.6020	.9198	.0087	1.6530	-.1444
3.76	.1328	-.0126	1.6609	.5623	.8592	.0234	1.6660	-.1539
4.85	.1728	-.0143	1.6698	.5543	.8469	.0311	1.6784	-.1596
7.44	.2692	-.0183	1.6718	.5444	.8319	.0503	1.6926	-.1701
10.08	.3723	-.0241	1.6814	.5424	.8288	.0724	1.7206	-.1831
15.34	.5694	-.0445	1.6744	.5511	.8421	.1060	1.7654	-.2031
20.59	.7652	-.0553	1.6700	.5473	.8362	.1290	1.8324	-.2253
23.79	.9045	-.0489	1.6498	.5354	.8180	.1620	1.8745	-.2273
-.41	-.0168	-.0048	1.6629	.5358	.8186	-.0048	1.6630	-.1525
19.48	.6834	-.0617	1.6795	.5591	.8543	.0841	1.8113	-.2111
22.65	.8215	-.0531	1.6570	.5423	.8286	.1202	1.8456	-.2105
24.78	.9061	-.0445	1.6244	.5321	.8131	.1418	1.8546	-.2151
30.14	1.1461	-.0205	1.5571	.5117	.7819	.2092	1.9220	-.2104
35.48	1.3959	.0014	1.4957	.4993	.7630	.2685	2.0281	-.2126
40.84	1.6530	.0270	1.4372	.4893	.7477	.3106	2.1683	-.2276
44.06	1.7826	.0388	1.3803	.4857	.7422	.3211	2.2316	-.2337
46.19	1.8733	.0453	1.3434	.4842	.7398	.3274	2.2818	-.2366
35.49	1.4031	.0008	1.4983	.4996	.7634	.2725	2.0346	-.2138
42.72	1.7015	.0353	1.4368	.4864	.7432	.2754	2.2099	-.2302
44.83	1.7918	.0411	1.3983	.4850	.7410	.2848	2.2549	-.2181
50.11	1.9766	.0598	1.2713	.4802	.7338	.2922	2.3319	-.2261
55.41	2.1375	.0692	1.1097	.4788	.7316	.2998	2.3896	-.2251
60.73	2.2736	.0758	.9342	.4782	.7306	.2966	2.4400	-.2330
66.02	2.3684	.0800	.7490	.4779	.7302	.2781	2.4683	-.2488
67.08	2.3970	.0802	.7149	.4781	.7305	.2751	2.4861	-.2505
69.22	2.4264	.0820	.6401	.4779	.7302	.2624	2.4957	-.2520
55.43	2.1417	.0685	1.1085	.4791	.7320	.3023	2.3925	-.2248
65.64	2.3365	.0829	.7761	.4768	.7285	.2568	2.4486	-.2331
67.74	2.3685	.0850	.6987	.4765	.7281	.2504	2.4567	-.2269
69.84	2.3843	.0856	.6186	.4765	.7281	.2413	2.4514	-.2284
75.04	2.4780	.0782	.4812	.4793	.7324	.1747	2.5182	-.2398
80.31	2.5120	.0534	.3111	.4861	.7427	.1163	2.5285	-.2396
85.49	2.5274	.0200	.1425	.4948	.7561	.0567	2.5307	-.2427
90.70	2.4757	-.0189	-.0307	.5050	.7716	.0005	2.4759	-.2215
92.77	2.4647	-.0305	-.0993	.5081	.7764	-.0200	2.4666	-.2251
80.29	2.5116	.0528	.3095	.4863	.7430	.1186	2.5278	-.2400

$M_\infty = 2.25$ $Re_d = 0.96 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.30	-.0683	-.0027	1.6935	.4740	.7242	-.0003	1.6949	-.1418
-.26	-.0013	-.0077	1.6729	.5482	.8377	.0063	1.6729	-.1297
1.79	.0660	-.0130	1.6690	.6290	.9612	.0137	1.6702	-.1255
3.85	.1326	-.0174	1.6773	.5859	.8953	.0198	1.6824	-.1324
4.87	.1662	-.0197	1.6829	.5774	.8823	.0226	1.6909	-.1378
7.45	.2508	-.0251	1.6887	.5655	.8640	.0297	1.7070	-.1454
10.02	.3357	-.0311	1.6843	.5607	.8568	.0375	1.7171	-.1503
15.16	.5182	-.0520	1.6836	.5656	.8643	.0600	1.7605	-.1693
20.35	.7008	-.0499	1.6629	.5466	.8351	.0789	1.8028	-.1868
23.45	.8206	-.0460	1.6361	.5367	.8201	.1016	1.8276	-.1957
-.25	.0003	-.0079	1.6777	.5482	.8377	.0077	1.6777	-.1335
19.65	.6343	-.0509	1.6559	.5526	.8443	.0405	1.7727	-.1758
22.77	.7603	-.0425	1.6362	.5366	.8199	.0679	1.8030	-.1798
24.81	.8381	-.0392	1.6149	.5306	.8108	.0831	1.8175	-.1761
30.04	1.0714	-.0208	1.5555	.5127	.7834	.1489	1.8829	-.1738
35.25	1.3104	-.0005	1.4937	.5003	.7644	.2080	1.9761	-.1761
40.47	1.5570	.0223	1.4284	.4906	.7497	.2574	2.0972	-.1859
43.59	1.6984	.0342	1.3779	.4868	.7439	.2801	2.1691	-.1963
45.66	1.7861	.0402	1.3430	.4853	.7415	.2877	2.2161	-.2028
35.25	1.3141	-.0005	1.4960	.5002	.7644	.2099	1.9801	-.1817
42.81	1.6437	.0287	1.4014	.4886	.7465	.2537	2.1451	-.1861
44.90	1.7388	.0351	1.3626	.4868	.7438	.2698	2.1926	-.1830
50.08	1.9291	.0471	1.2347	.4840	.7396	.2911	2.2718	-.2001
55.27	2.0915	.0554	1.0702	.4827	.7375	.3118	2.3286	-.1960
60.45	2.2288	.0647	.8984	.4810	.7350	.3178	2.3820	-.2020
65.67	2.3316	.0727	.7099	.4796	.7328	.3139	2.4170	-.2047
66.69	2.3494	.0731	.6755	.4796	.7329	.3093	2.4250	-.2065
68.73	2.3800	.0730	.6127	.4799	.7333	.2925	2.4401	-.2066
55.27	2.0944	.0550	1.0705	.4828	.7377	.3136	2.3311	-.1968
65.82	2.3022	.0660	.7104	.4812	.7353	.2948	2.3912	-.1918
67.90	2.3212	.0661	.6281	.4814	.7355	.2914	2.3870	-.1901
69.93	2.3604	.0674	.5611	.4813	.7354	.2830	2.4096	-.1891
75.09	2.4319	.0626	.4236	.4832	.7383	.2165	2.4590	-.1937
75.09	2.4355	.0630	.4249	.4831	.7381	.2161	2.4628	-.1954
80.20	2.4897	.0441	.2771	.4884	.7463	.1506	2.5006	-.1933
85.32	2.4978	.0127	.1285	.4967	.7589	.0758	2.5000	-.1982
90.43	2.4647	-.0184	-.0169	.5049	.7715	-.0014	2.4647	-.1797
92.48	2.4490	-.0310	-.0753	.5083	.7766	-.0306	2.4499	-.1769
80.20	2.4781	.0440	.2759	.4884	.7463	.1498	2.4889	-.1938

$M_\infty = 2.50$ $Re_d = 1.00 \times 10^6$ $L/d = 1.528$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.30	-.0574	-.0030	1.6878	.4658	.7118	.0102	1.6887	-.1240
-.24	-.0017	-.0072	1.6806	.5531	.8452	.0054	1.6806	-.1163
1.78	.0524	-.0120	1.6750	.6503	.9936	.0003	1.6758	-.1146
3.85	.1076	-.0163	1.6756	.5989	.9151	-.0051	1.6790	-.1153
4.87	.1356	-.0176	1.6789	.5848	.8935	-.0074	1.6843	-.1173
7.42	.2070	-.0201	1.6766	.5634	.8609	-.0112	1.6892	-.1239
9.98	.2837	-.0224	1.6801	.5517	.8430	-.0118	1.7038	-.1276
15.13	.4458	-.0395	1.6892	.5580	.8527	-.0105	1.7470	-.1439
20.24	.6156	-.0446	1.6726	.5474	.8364	-.0011	1.7823	-.1570
23.37	.7365	-.0434	1.6599	.5386	.8230	.0178	1.8158	-.1644
-.26	-.0018	-.0073	1.6783	.5531	.8452	.0058	1.6783	-.1157
19.62	.5848	-.0457	1.6409	.5512	.8422	-.0002	1.7420	-.1427
22.72	.6923	-.0415	1.6204	.5393	.8240	.0127	1.7621	-.1477
24.79	.7691	-.0363	1.5967	.5309	.8112	.0289	1.7721	-.1410
29.95	.9835	-.0203	1.5416	.5135	.7847	.0825	1.8267	-.1443
35.18	1.2222	-.0060	1.4949	.5032	.7689	.1378	1.9260	-.1514
40.40	1.4808	.0188	1.4327	.4917	.7513	.1991	2.0508	-.1620
43.54	1.6183	.0333	1.3709	.4865	.7434	.2286	2.1085	-.1688
45.62	1.7149	.0404	1.3269	.4846	.7404	.2512	2.1537	-.1708
35.16	1.2284	-.0062	1.5011	.5033	.7691	.1399	1.9346	-.1525
42.79	1.5793	.0176	1.3881	.4927	.7528	.2159	2.0915	-.1465
44.85	1.6617	.0247	1.3443	.4903	.7491	.2299	2.1250	-.1541
50.05	1.8492	.0416	1.2104	.4853	.7415	.2594	2.1948	-.1643
55.24	2.0256	.0502	1.0525	.4838	.7392	.2901	2.2642	-.1622
60.46	2.1777	.0623	.8717	.4813	.7354	.3154	2.3243	-.1694
65.65	2.2964	.0670	.6695	.4809	.7348	.3368	2.3682	-.1704
66.70	2.3255	.0669	.6323	.4812	.7352	.3390	2.3860	-.1708
68.76	2.3586	.0666	.5584	.4815	.7358	.3338	2.4007	-.1713
55.25	2.0222	.0485	1.0474	.4843	.7400	.2919	2.2586	-.1633
65.85	2.2677	.0598	.6603	.4828	.7377	.3251	2.3394	-.1602
67.93	2.2943	.0602	.5861	.4828	.7378	.3189	2.3464	-.1597
69.99	2.3179	.0598	.5207	.4831	.7382	.3040	2.3561	-.1580
75.11	2.3913	.0571	.3879	.4844	.7401	.2397	2.4107	-.1605
80.22	2.4361	.0475	.2568	.4872	.7445	.1607	2.4443	-.1598
85.32	2.4756	.0236	.1241	.4938	.7545	.0782	2.4775	-.1614
90.42	2.4608	-.0062	-.0130	.5016	.7665	-.0053	2.4608	-.1543
92.47	2.4448	-.0188	-.0650	.5050	.7717	-.0405	2.4454	-.1484
80.22	2.4360	.0469	.2565	.4874	.7448	.1610	2.4442	-.1596

$M_\infty = 2.50$ $Re_d = 0.98 \times 10^6$ $L/d = 1.15$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.27	-.0505	.0088	1.6799	.6517	.7494	.0160	1.6806	-.1250
-.23	-.0030	.0001	1.6777	.6592	.7581	.0038	1.6777	-.1189
1.82	.0433	-.0089	1.6717	.6792	.7811	-.0097	1.6723	-.1163
3.82	.0883	-.0164	1.6641	.6616	.7609	-.0228	1.6663	-.1147
4.86	.1116	-.0198	1.6651	.6542	.7523	-.0298	1.6686	-.1157
7.40	.1703	-.0254	1.6651	.6295	.7239	-.0454	1.6732	-.1185
9.95	.2297	-.0300	1.6576	.6135	.7055	-.0600	1.6724	-.1226
15.04	.3432	-.0418	1.6661	.6059	.6968	-.1008	1.6981	-.1286
20.16	.4697	-.0482	1.6621	.5892	.6776	-.1319	1.7222	-.1500
23.23	.5553	-.0482	1.6400	.5754	.6617	-.1365	1.7261	-.1572
-.25	-.0039	.0004	1.6775	.6592	.7581	.0034	1.6775	-.1183
19.54	.4439	-.0487	1.6418	.5953	.6846	-.1307	1.6957	-.1467
22.61	.5257	-.0476	1.6235	.5787	.6655	-.1390	1.7008	-.1466
24.64	.5841	-.0460	1.6085	.5684	.6537	-.1398	1.7056	-.1482
29.80	.7495	-.0376	1.5562	.5436	.6251	-.1229	1.7229	-.1491
34.96	.9471	-.0267	1.5113	.5245	.6032	-.0899	1.7813	-.1533
40.13	1.1369	-.0089	1.4379	.5068	.5829	-.0576	1.8321	-.1605
43.25	1.2427	.0012	1.3800	.4992	.5740	-.0404	1.8566	-.1647
45.34	1.3150	.0071	1.3367	.4953	.5696	-.0263	1.8749	-.1676
34.98	.9496	-.0272	1.5117	.5249	.6037	-.0885	1.7830	-.1611
53.08	1.5133	.0244	1.1263	.4860	.5589	.0084	1.8864	-.1649
42.60	1.2299	-.0058	1.3959	.5041	.5797	-.0394	1.8600	-.1626
44.68	1.2918	.0020	1.3526	.4986	.5734	-.0325	1.8701	-.1595
49.83	1.4308	.0169	1.2250	.4897	.5632	-.0131	1.8835	-.1605
55.01	1.5500	.0267	1.0622	.4850	.5578	.0187	1.8790	-.1637
60.18	1.6597	.0387	.8849	.4797	.5517	.0575	1.8800	-.1688
65.38	1.7398	.0453	.6907	.4773	.5490	.0970	1.8693	-.1707
66.41	1.7507	.0458	.6530	.4773	.5489	.1020	1.8657	-.1705
68.48	1.7805	.0463	.5804	.4774	.5490	.1133	1.8693	-.1706
55.01	1.5511	.0251	1.0603	.4859	.5588	.0208	1.8787	-.1660
65.75	1.7318	.0479	.6747	.4760	.5473	.0961	1.8561	-.1601
67.80	1.7554	.0490	.6056	.4757	.5471	.1025	1.8541	-.1608
69.86	1.7659	.0491	.5360	.4758	.5472	.1048	1.8424	-.1630
74.98	1.8069	.0454	.3917	.4781	.5499	.0898	1.8467	-.1633
80.13	1.8382	.0355	.2581	.4832	.5557	.0608	1.8552	-.1612
85.21	1.8554	.0178	.1250	.4917	.5654	.0304	1.8594	-.1611
90.32	1.8414	-.0007	-.0087	.5003	.5754	-.0014	1.8414	-.1528
92.39	1.8436	-.0092	-.0619	.5044	.5800	-.0149	1.8445	-.1516
80.11	1.8395	.0344	.2573	.4837	.5563	.0625	1.8563	-.1585

$M_\infty = 2.50 \qquad Re_d = 0.98 \times 10^6 \qquad L/d = 0.75$

ALPHA-M	CN	CM	CAT	X-CP/L	X-CP/D	CL	CD	CPB
-2.27	-.0330	.0078	1.6908	.7065	.8125	.0341	1.6908	-.1232
-.25	-.0011	-.0015	1.6877	.7460	.8579	.0063	1.6877	-.1224
1.78	.0305	-.0109	1.6890	.8107	.9323	-.0220	1.6891	-.1228
3.79	.0603	-.0184	1.6896	.7653	.8800	-.0516	1.6899	-.1244
4.80	.0744	-.0217	1.6852	.7533	.8663	-.0670	1.6855	-.1288
7.30	.0996	-.0287	1.6968	.7504	.8629	-.1169	1.6957	-.1368
9.83	.1293	-.0345	1.6930	.7320	.8417	-.1617	1.6902	-.1427
14.90	.2019	-.0446	1.6977	.6921	.7960	-.2415	1.6925	-.1491
19.95	.2856	-.0502	1.6733	.6529	.7508	-.3026	1.6704	-.1498
23.01	.3483	-.0517	1.6579	.6290	.7234	-.3274	1.6622	-.1568
-.25	-.0005	-.0031	1.6882	.7460	.8579	.0069	1.6881	-.1235
19.41	.2865	-.0483	1.6528	.7247	.5435	-.2789	1.6541	-.1477
22.44	.3413	-.0494	1.6299	.6931	.5198	-.3068	1.6368	-.1481
24.51	.3835	-.0498	1.6211	.6732	.5049	-.3235	1.6341	-.1512
29.57	.4983	-.0489	1.5814	.6307	.4730	-.3470	1.6213	-.1604
34.71	.6345	-.0450	1.5371	.5946	.4460	-.3536	1.6249	-.1695
39.86	.7678	-.0362	1.4570	.5629	.4222	-.3443	1.6105	-.1655
42.94	.8426	-.0281	1.3987	.5444	.4083	-.3361	1.5979	-.1656
44.98	.8917	-.0221	1.3515	.5330	.3998	-.3246	1.5863	-.1681
34.73	.6384	-.0460	1.5410	.5960	.4470	-.3533	1.6301	-.1684
42.43	.8378	-.0288	1.3896	.5458	.4094	-.3192	1.5909	-.1627
44.46	.8794	-.0235	1.3500	.5356	.4017	-.3179	1.5795	-.1628
49.61	.9711	-.0109	1.2292	.5149	.3862	-.3069	1.5361	-.1627
54.77	1.0407	.0008	1.0718	.4990	.3742	-.2750	1.4684	-.1647
59.92	1.0901	.0130	.8901	.4841	.3631	-.2240	1.3894	-.1689
65.04	1.1238	.0197	.7017	.4766	.3574	-.1619	1.3149	-.1687
66.10	1.1320	.0208	.6647	.4755	.3566	-.1491	1.3043	-.1693
68.15	1.1466	.0216	.5922	.4748	.3561	-.1229	1.2846	-.1696
54.76	1.0442	.0000	1.0733	.4999	.3750	-.2740	1.4722	-.1685

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author) Arnold Engineering Development Center Arnold Air Force Station, Tennessee 37389	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP N/A

3 REPORT TITLE

STATIC STABILITY AND AXIAL-FORCE CHARACTERISTICS OF SEVERAL FLAT-FACED RIGHT CIRCULAR CYLINDERS AT SUBSONIC AND SUPERSONIC SPEEDS AND ANGLES OF ATTACK FROM 0 TO 90 DEGREES

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report - July 6 through July 13, 1972

5 AUTHOR(S) (First name, middle initial, last name)

R. W. Rhudy and S. S. Baker, ARO, Inc.

6 REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO OF REFS
January 1973	86	4

8a CONTRACT OR GRANT NO b. PROJECT NO 6065 c. Program Element 62201F d. Task 05	9a. ORIGINATOR'S REPORT NUMBER(S) AEDC-TR-72-180 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) ARO-VKF-TR-72-152

10 DISTRIBUTION STATEMENT

Approved for public release; distribution unlimited.

11 SUPPLEMENTARY NOTES Available in DDC	12 SPONSORING MILITARY ACTIVITY Air Force Flight Dynamics Laboratory (FER), Wright Patterson AFB, OH 45433

13 ABSTRACT

Tests were conducted at Mach numbers from 0.2 to 0.8 and 1.5 to 2.5 to determine the effects of fineness ratio and angles of attack up to 90 deg on the static longitudinal stability and axial force of a flat-faced cylinder. Data are presented to show that, at subsonic speeds, a reduction in the length-to-diameter ratio from 1.5 to 0.75 caused an increase in the total axial force, a decrease in normal force (in fact slightly negative normal force at small angles of attack), and a decrease in the absolute magnitude of the pitching moment over the entire pitch range. At supersonic speeds, total axial force was nearly independent of fineness ratio, for the range tested, while normal force and pitching moment decreased with a decrease in length-to-diameter ratio. Tabulated and plotted data for the entire test matrix are presented.

DD FORM 1 NOV 65 1473

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
cylindrical bodies						
blunt bodies						
static stability						
axial force						
aerodynamic characteristics						
subsonic flow						
supersonic flow						
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